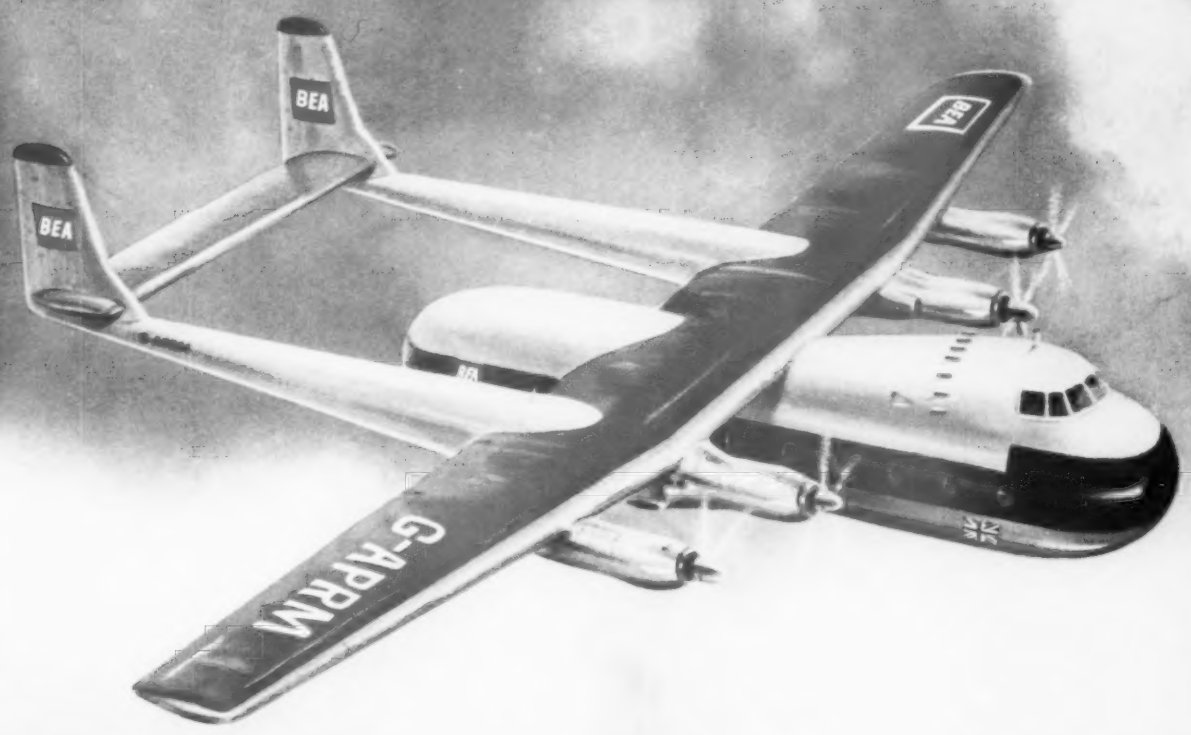
THE AEROPLANE and ASTRONAUTICS

OCTOBER 2

EVERY THURS
ONE SHILLING
AND SIXPENCE



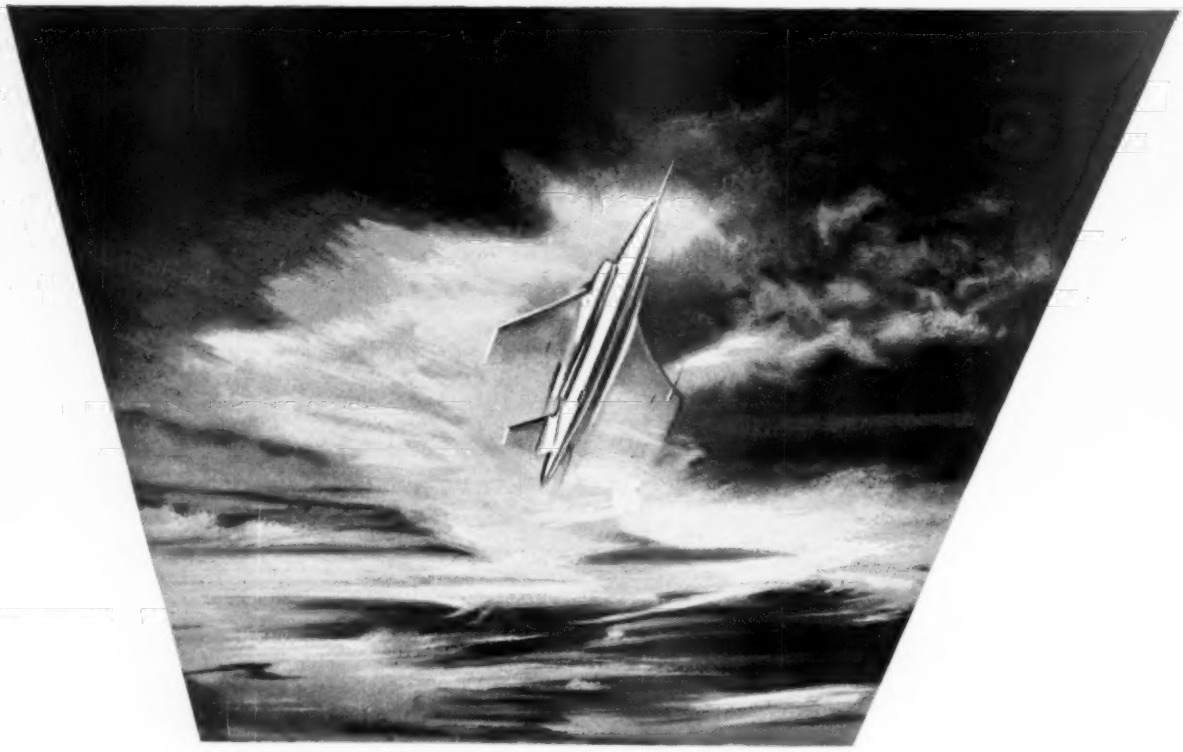
BEA Buys the Argosy

The Armstrong Whitworth Argosy has been ordered by British European Airways to begin operations on European freight routes this winter. ☐ By ordering the Argosy, BEA have acknowledged that air freight is a service on its own rather than just an ancillary to passenger operations. ☐ The Rolls-Royce Dart powered Argosy with its large unobstructed freight hold, double-end loading and "Rolamat" cargo handling system, can handle and carry heavy and bulky freight easily and economically. BEA can now prove that:

The Argosy brings the cost of air freight down to earth

HAWKER SIDDELEY AVIATION

32 Duke Street, St. James's, London, S.W.1



RELIABILITY BREEDS CONFIDENCE

The pilot's control of his aircraft is at all times positive and precise, instilling in him that confidence in manoeuvre so vital to successful accomplishment.

Blackburn
Buccaneer

Incorporating

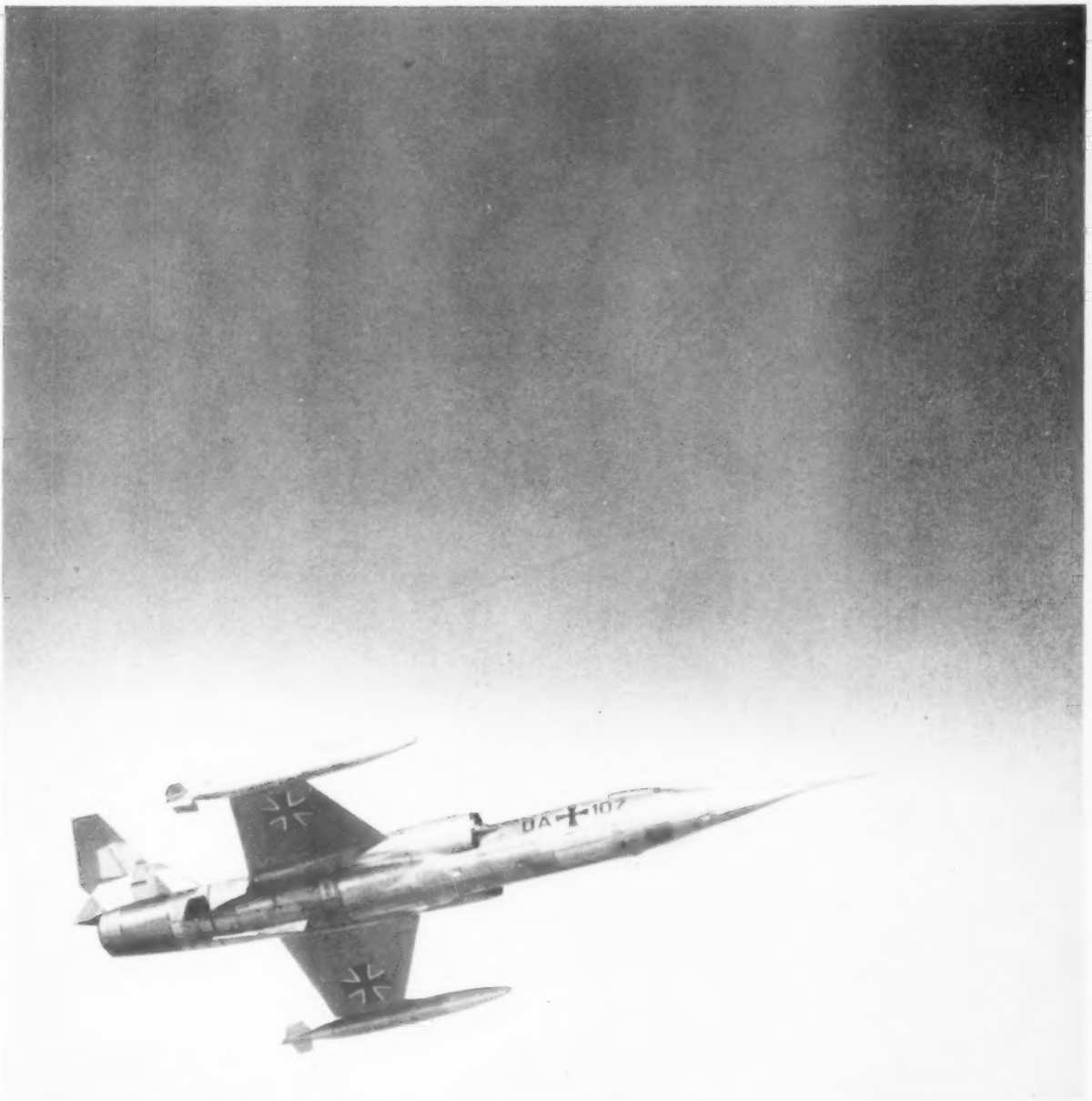
Positive
Precise
Power Controls

BOULTON PAUL AIRCRAFT LTD

MEMBER OF THE DOWTY GROUP

WOLVERHAMPTON – ENGLAND

Second class postage paid at New York, N.Y.



Hamilton Standard components fly with West Germany's F-104G

Lockheed's F-104G Starfighter, multi-mission version of the United States Air Force's F-104 all-weather high altitude fighter, is the newest defense weapon of West Germany. Hamilton Standard pneumatic starter and afterburner fuel controls have been specified for the West German Air Force F-104G power system. These are the same components that have contributed importantly to the spectacular performance of the F-104, holder of the world's altitude record. □ *In addition to West Germany, many other countries will use the versatile F-104G, including Belgium, Denmark, Norway, Canada, Holland, Italy and Japan.*

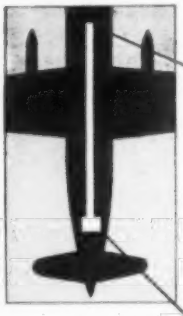
UNITED AIRCRAFT INTERNATIONAL

East Hartford 8, Connecticut, U.S.A.

HAMILTON STANDARD · SIKORSKY · NORDEN

European Headquarters:
3/5 Warwick House Street, London S.W. 1, England

A



If you have the AIRCRAFT we have the FLOOR . . .

MALLITE EGB FLOORS

Service proved by
over 20 airlines and operators.
In operation all over the world.
In service or going into service
in 17 different types of aircraft.
Proof against stiletto heels.
Comparatively low priced.
Easy to install and maintain.
The most-tested floor in service today.
The answer to a floor problem
in any aircraft.

Illustration shows Viscount Replacement Floor

Floors available for all Aircraft types

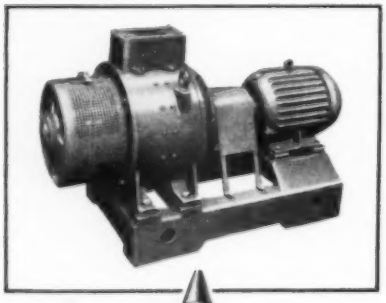
William Mallinson and Sons Ltd.

AIRCRAFT DIVISION · THAMES ROAD · CRAYFORD · KENT

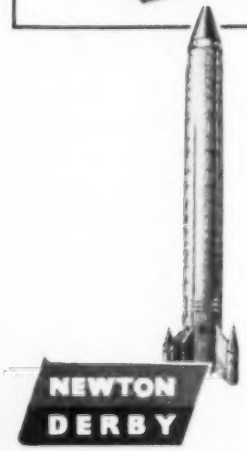
Telephone: CRAYFORD 26244 *Telegrams: CEMENTED, CRAYFORD*

MANUFACTURERS OF PLYWOOD · ARMOURPLY · PANELS AND AIRCRAFT LAMINATES

How does NBD speed the count down?



- Servo Motors
- Automatic Voltage Regulators
- Transistor Convertors
- Rotary Transformers and Convertors
- Motor Generator Sets
- High Frequency Alternators (400 to 3,000 c.p.s.)
- Permanent Magnet Alternators



Power for the essential pre-flight checking of the electronic equipment vital to the successful operation of rocket-powered vehicles is supplied by NBD motor alternators.

When Britain's first satellite is ready for launching, NBD will be there.

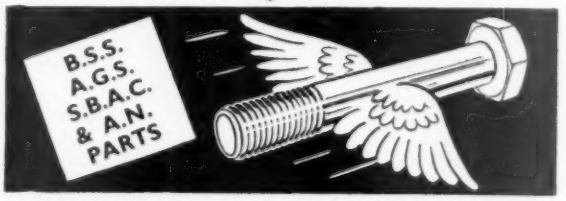
NEWTON BROS. (DERBY) LTD.
ALFRETON ROAD, DERBY

Telephone: Derby 47676 (4 lines)
Grams: DYNAMO DERBY
London Office:—
IMPERIAL BUILDINGS, 56 KINGSWAY, W.C.2

NEWTON DERBY

MILLER AVIATION LTD.

A member of the group of companies



TEL.: REDHILL 5050 *CABLES:* SASCO - REDHILL - TELEX
TELEX: 21433

ADASTRAL HOUSE
NUTFIELD · REDHILL · SURREY

Precision Sheet Metal Workers and Light Engineers to the Aircraft Industry

Manufacturers of fabricated parts and assemblies in ferrous and non-ferrous metals. Tools, jigs and machined parts for the assemblies can be produced in our own workshops.

Let us quote for your requirements.

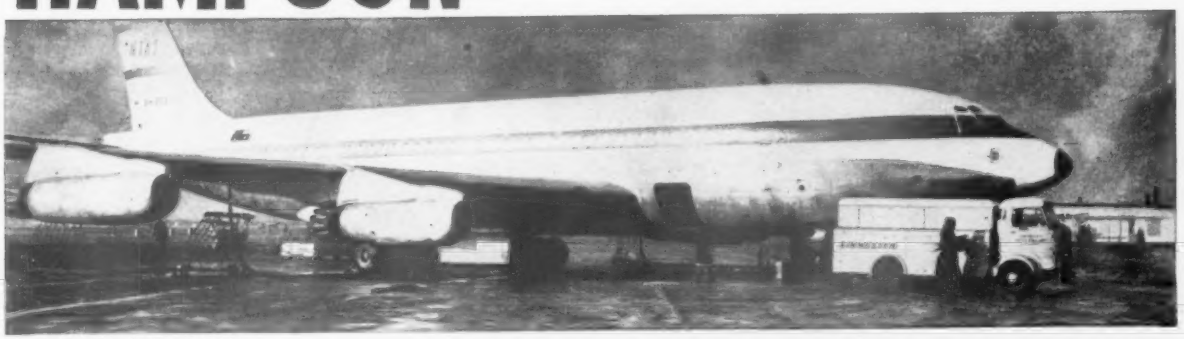
M.O.A. Approved D.G.I. No. 50037 *Fully Approved A.R.B. Ref. No. A1/2502/47*

C. W. FLETCHER & SONS LTD.
STERLING WORKS, ARUNDEL STREET, SHEFFIELD, 1

ALSO MORTIMER WORKS, MATILDA LANE, SHEFFIELD, 1

Telephone: Sheffield 28049 & 28040 ESTABLISHED 1891 Telegrams: Assayed Sheffield 1

HAMPSON NEW GROUND POWER UNITS



LOOK AT THE PLUS FEATURES!

POWERMASTERS

FOR ELECTRICAL STARTING & SERVICING

- ★ ROLLS-ROYCE 'C' range engines on diesel driven models.
- ★ HEAVY DUTY GENERATORS and TRANSISTORISED CONTROLS. For all models.
- ★ BRUSHLESS SELF REGULATING ALTERNATORS for 400 c.p.s. sets.
- ★ CHOICE OF STANDARD BASIC UNITS including the "UNILEC" fully integrated universal set.

AIR MASTERS

FOR AIR STARTING, AIR CONDITIONING, DE-ICING & PNEUMATIC SYSTEM CHECKOUT

- ★ HIGHEST PRESSURES of any continuous flow ground air supply for jet airliner starting and checkout.
- ★ 10,000 HOURS RUNNING TIME between compressor overhauls.
- ★ TRANSATLANTIC INTERCHANGEABILITY of parts with "STRATOSAIR" start cart.

THE ONLY COMPLETE RANGE OF LOW MAINTENANCE INDUSTRIAL SETS IN EUROPE

WORLD WIDE SERVICING FOR JETS

HAMPSON INDUSTRIES LIMITED

Aircraft Ground Power Division · GREETS GREEN · WEST BROMWICH · ENGLAND

HAMPSON

Interplanetary Flight

An Introduction to Astronautics By ARTHUR C. CLARKE

INTERPLANETARY FLIGHT is both a lucid introduction to the new science of astronautics and an exciting survey of the possibilities and problems of space travel.

Recent spectacular developments in the field of astronautics, many of them accurately predicted by the author in the first edition, are now recorded in this new edition, which also contains a new chapter on Earth Satellites and Lunar Probes, new illustrations and a comprehensive index.

From reviews of the first edition :

"Remarkably comprehensive, exciting and persuasive."
—The Times Weekly.

"The text is authoritative and is written throughout in the author's energetic style, so well suited to the needs of the general reader as to make the development of a technical argument an exciting mental adventure."
—British Interplanetary Society Journal.

2nd Edition $8\frac{3}{8} \times 5\frac{1}{8}$ *in.* 160 *pp.* *Illustrated* *Fabroleen Boards*

12s. 6d. net from booksellers or 13s. 2d. by post from the publishers

TEMPLE PRESS BOOKS, Bowling Green Lane, London, E.C.1

Folland Gnat–
the new advanced trainer for the Royal Air Force

HAWKER SIDDELEY AVIATION
32 Duke Street, St. James's, London S.W.1.

THE AEROPLANE and ASTRONAUTICS

VOLUME 101 NUMBER 2609 OCTOBER 19, 1961

Airfields in the Principality

One of the noticeable things about the air network over the United Kingdom is that the aerodromes exist where there is the maximum of competition from existing systems of transport. In places where communications are difficult the air services and aerodromes stay away. If you look at an air map it is surprising how the air services, like the railway and road networks, radiate outwards from London. It is quite difficult to find air services which cut across the country, missing out London.

We have from time to time drawn attention to the way in which Cornwall is excluded from the air network. Indeed in order to fly to the Scilly Isles by B.E.A. you have to travel a great part of the way by British Railways before, at the tip of the Cornish mainland, you find the aerodrome whence you will take plane to the Scillies.

No doubt it will be explained that just as the old-established lines of communication have been brought into being to supply a need, so the same thing applies to civil aircraft and it is no good expecting air services to be provided where the demand for transport is low. This is perhaps the place to note that although the services of B.E.A. are much appreciated by the inhabitants who use them, the services are run only at a loss.

These considerations arise with news of the submission made by five mid-Welsh county authorities to the Welsh Advisory Commission for Civil Aviation, of which Sir Miles Thomas is chairman. It is hard to see that there could be very much traffic by air in and out of the area round Towyn in the middle of the Cardigan Bay coastline; at first sight it would seem that there would be even less from the Montgomeryshire area which are two suggested locations for a new airfield.

Nevertheless, it is strange that more people do not go to Wales from England. The distances are small and the country delightful. There will be cynics to be found who will say that it is the difficulty of communications which makes for the charm of so much in Wales. Taking visitors in by air would in no way destroy the amenities.

More Pilots in the Army

News that the Army is working out a new policy of manning its aircraft is explained by the War Office as a matter of internal reorganization rather than having any significance with regard to basic policy. It does seem to be accepted however that the decision that certain arms will man the aircraft used in normal tactical rôles will in effect expand the air potential of the Army. By bringing in pilots from the arms concerned (such as the Royal Artillery) and not taking them from the Army Air Corps means that within the ceiling set for the Army of 182,000 men, there will be no need to expand the Air Corps at the expense of other arms.

The introduction of the new policy will bring to mind the potentialities of the new small helicopters and in particular that of the gyroplane with its built-in simplicity. The new Beagle-Wallis machine has been impressing a lot of people with its capabilities. Its adoption by the Army would obviously require the training of many more pilots.

Having watched on television recently a demonstration of landing from a boat by means of the Bell rocket belt one might be excused from wondering how soon every infantryman will be his own pilot.

Editor - - - - THURSTAN JAMES
Deputy Editor - - - - F. T. MEACOCK

Founder Editor (1911-1939) *C. G. Grey*

Proprietors - - TEMPLE PRESS LIMITED
Chairman and Managing Director:
ROLAND E. DANGERFIELD

Editorial, Advertisement and Publishing Offices:
BOWLING GREEN LANE, LONDON, E.C.1

Telephone: TERminus 3636
Telegrams: "Pressimus London Telex"
Telex: 23839

Annual Subscription Rate: United Kingdom £4 15 0
Overseas £5 Canada and U.S.A. $15.00

© Temple Press Limited, 1961. The proprietors will consider any written requests to reproduce articles and illustrations appearing in this journal. Comment and brief extracts which acknowledge *The Aeroplane and Astronautics* are permissible.

Matters of Moment

Noise Makes Money?

STUDY of the real-estate areas in the vicinities of New York, Chicago-O'Hare and San Francisco international airports shows that property values have increased. The Port of New York Authority commissioned H. O. Walther, a real-estate consultant, to make the study and a summary has been issued by the National Aircraft Noise Abatement Council in the U.S.

The study conclusion is reached that airports do not adversely affect the market value of real estate in the vicinity of the three considered.

Nearly 400 market transactions revealed that the market behaviour is about the same in airport areas as in areas not near airport activity. In the period 1948 to 1958, the ratios of increase in the value of residences tended to be the same, regardless of location. The cheaper homes increased about 40% in value, and the higher-priced homes about 30%.

Tens of thousands of homes have been built in the communities adjoining the airports during the 10-year period and there is evidence that many more will be built. The number of properties for sale in the airport areas was not conspicuously more than in communities not near to airports. No appreciable difference in market value was found in areas in the path of flight, compared with the others near the airport.

Trade opinion of real-estate brokers indicated that, without exception, airports had not adversely influenced the value of homes. Maintenance of the properties and the pride of ownership were not different in the airport areas from comparable areas farther away. The study results bear out similar findings from projects covering airports at Chicago-Midway (the busiest in the World with 800 movements daily on 640 acres of land), Dallas, Denver, Los Angeles, Newark, New York-La Guardia and Seattle.

A Case for Heliports

FOLLOWING our observations last week about the need for some co-ordinated planning for heliports and other necessary adjuncts to city-centre helicopter services, we have received a comment on this situation from Mr. H. M. Berney, a director of Rotoports, Ltd. He writes:—

"Your recent reports as to the attitude of the Westminster, Battersea and Lambeth Borough Councils to the proposed building of London's International Heliport at Nine Elms makes one wonder just what peculiar characteristic of the British people causes them to continue to be just so far behind the times. It would even appear that this is another example of a peculiar trait of the British in always resisting to the very last any modern innovation or transport development. Our present economic position is an example of this lack of foresight and forward planning and resistance to modern techniques and methods.

"Westminster City Council together with Battersea and Lambeth Borough Councils are reported to be resisting to the last the Ministry of Aviation's plans to construct an International Heliport at Nine Elms.

"London is the only major international World city without a city-centre heliport and just cannot afford to continue to procrastinate on this problem whilst other nations are rapidly developing city-centre services.

"How is it that the citizens of Brussels, Rotterdam, Paris, New York, Chicago, Los Angeles, etc., etc., who are just as susceptible to 'intolerable noise,' are not suffering in any way from the completely 'intolerable noise' alleged by the worthy Councillors of these three London Boroughs which have no experience of helicopters whatsoever?

"In any case, perhaps the same worthy Councillors do not know that many helicopters are daily passing through the air above their respective Boroughs, due to the fact that helicopters proceeding to and from the present Battersea Heliport cross London over the course of the River Thames. Has Westminster Council received numerous complaints caused by helicopters regularly operating in and out of the grounds of Buckingham Palace?

"The selfish attitude adopted by certain London Boroughs in this respect defies understanding. If taken to a logical conclusion, the apparently only acceptable locations for a heliport in the British Isles would appear to be the middle of Dartmoor or the middle of the North Sea.

"There is no point, whatsoever, of having helicopter travel at all if advantage cannot be taken of the helicopter's ability to operate into and out of city centres. Let us be realistic about this: of course there will be some noise, but Central London is already full of noise from numerous railways, stations, shipping and traffic. One would have thought that this country would already have learned its lesson 100 years ago when the railways came. Many cities and towns owe their current prosperity and position to the railways, others have lost ground. Northampton is an example, as no main line railway serves the town, the main line having had to miss the town due to local objections at the time of construction.

"The Nine Elms site is, in any case, probably the finest possible site in Central London, as it is surrounded by a mass of already existing railway yards on three sides and the Thames on the other."

The Spey Airborne

INTENDED initially for the D.H. Trident and the B.A.C. One-Eleven jet transports, the Rolls-Royce Spey by-pass turbojet made its initial flight on Oct. 12. Two RSp.1 Mk. 505-5 engines were mounted in the inboard nacelles of an Avro Vulcan, which was flown from Hucknall by Jim Heyworth, chief test pilot of the Rolls-Royce company.

Two flights were made on that day, totalling about four hours, and resulted in favourable reports on Spey handling. The Spey, which has been under development since December, 1960, has an initial take-off thrust rating of 9,850 lb., and a maximum continuous output of 9,450 lb. It is also being developed for military application under an M.o.A. contract for the Blackburn Buccaneer S.2.

The prototype Trident, which is also the first production aircraft for B.E.A., has had non-flight versions of the Spey installed for ground runs, after its roll-out, and is currently undergoing systems checking until the scheduled arrival of its definitive powerplants.

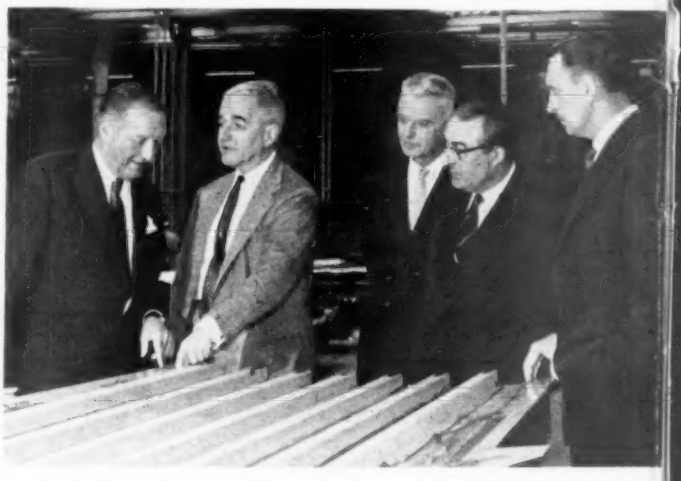
Expectations of Ranger 2

AS we go to press, preparations are advanced at Cape Canaveral for the launching of Ranger 2—the second spacecraft of a series which has the ultimate aim of rough-landing instrument capsules on the Moon. An article on page 526 of this issue explains some of the background to this programme and gives some information on the tracking facilities.

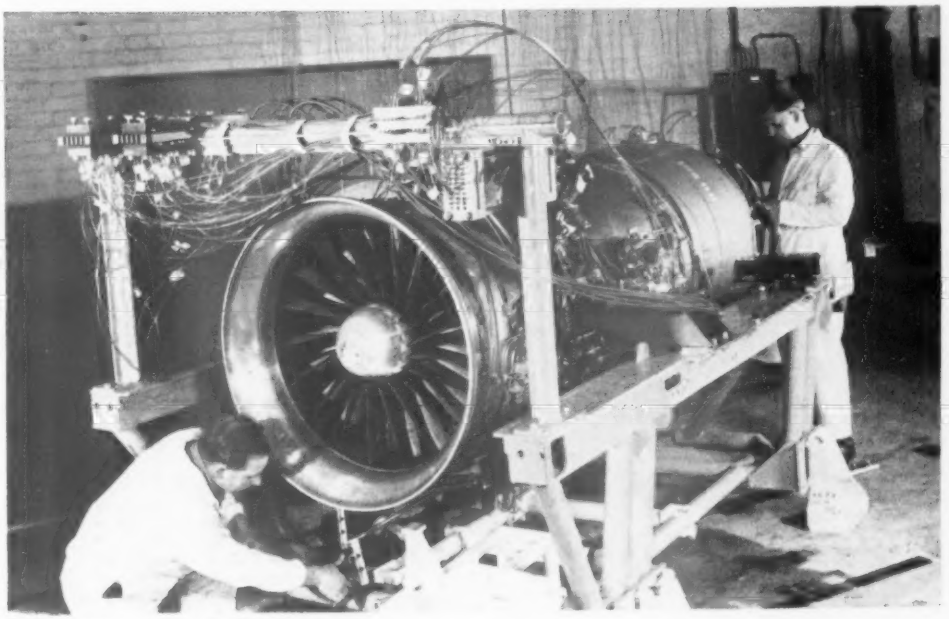
The first two launchings have been designed to prove the spacecraft's control and communication, without attempting to reach the Moon. Ranger 1 was launched on Aug. 23 and placed in a low Earth-orbit, but it failed to enter the elliptical orbit for which it was designed which would have carried it some 500,000 miles into space.

Despite the fact that the various scientific research instruments it contained did not get the opportunity of working in the desired environment, the launching was stated to have been useful in testing certain of the vehicle's sub-systems. It had been instrumented to study cosmic rays, magnetic fields, and radiation and dust particles in space, together with a rather unique experiment to try to discover if the Earth carries along with it "a comet-like tail of hydrogen gas."

Similar instruments are carried in Ranger 2. Control and



VISITING FOKKERS.—H.M. Ambassador to the Netherlands, Sir Andrew Noble, recently inspected Friendship production at Fokker's Schiphol factory. Here the Ambassador (second from left) is with Mr. F. J. Diepen (left), the company's commercial director; Mr. W. H. Wicherlink; Mr. W. Hatch, B.E.A.'s chief representative in Holland; and Mr. H. H. van Doorn.



FIRST FLIGHT.—As recorded on the opposite page the Rolls-Royce Spey civil turbojet (right) has now started flight development tests installed in a Vulcan V-bomber. This is seen below getting two Speys—in the inboard nacelles — airborne for the first time from Hucknall aerodrome.

communication equipment includes an attitude stabilization system based on celestial references (Sun and Earth), a high-gain "pointable" antenna; and an advanced communications system. One of the primary tasks of the launching is to test the associated components "for long periods in a space environment," and to calibrate the solar cells which extend from the spacecraft after it has arrived in space.

The intention is for the spacecraft to remain in space for about 50 days before returning to the Earth's atmosphere and burning up.

The second phase of the Ranger project is expected to start early next year with the attempt to land capsules on the lunar surface. These Rangers also will take television pictures as they approach the Moon. In the third phase, four Rangers will carry high-resolution TV cameras designed to send back to Earth fine-grain pictures of the lunar surface right up to the moment of impact.

GAPAN Awards

NOMINATIONS are being invited by the Guild of Air Pilots and Air Navigators for the award of the Guild's 1960/61 Trophies and Medal. These nominations, complete with supporting details, should reach the GAPAN office at 14 South Street, Park Lane, London, W.1, not later than Dec. 8. Candidates must be British subjects, but need not be Freemen of the Guild; the achievement must have taken place between Oct. 1, 1960, and Sept. 30, 1961, or have culminated during that period.

Oldest of the Guild's awards, the JOHNSTON MEMORIAL TROPHY, is awarded annually "to a person or persons for the most outstanding performance or record of aerial navigation, or for flights involving the development of the technology of navigation, or for the development of the principles of navigation." The CUMBERBATCH TROPHY is awarded annually "to a person or persons who have made an outstanding contribution to air safety"; it may be given for reliability of air operation, or for the development of aids to safe flight. The BRACKLEY MEMORIAL TROPHY, of which the terms of reference have been amended, is dedicated primarily to the operation of flying-boats; it is awarded annually to a transport pilot or pilots, air navigator or navigators, for outstanding flying contributing to the operational development of air transport or transport aircraft or of new techniques in air transport flying.

Most recent of the GAPAN awards, the DERRY AND RICHARDS MEMORIAL MEDAL, is given annually to a pilot, not on active service in Her Majesty's regular forces but professionally engaged in flying, for testing or development of British aircraft, whose flying over a period of time, including 1961, has been of outstanding value to the advancement of the science of aviation. The medal becomes the personal property of the recipient.

Helicopter Control Developments

A RECENT paper by N. Sullivan and J. A. Simpson, read before the R.Ae.S. Rotorcraft Section, on integrated flight systems for multi-engined helicopters provides a good deal of useful information on a topic of great importance to those concerned with the operation of civil transport helicopters on regular services. It sets out in concise terms the extent of the problem and gives a useful summary of achievements in this particular field to date. It serves also as a timely reminder that there is still much to be done in this direction.

The authors were, in fact, at pains to point out that a viable flight system must be "devised, developed and certificated" before commercial helicopter operation could be contemplated in the environment for which civil transport helicopters are being developed. Such a system, they suggest, is likely to consist of a combination of visual and automatic aids that will reduce the pilot's task "at least until it is comparable with that of the aeroplane pilot—and without becoming entirely dependent on the correct functioning of any single unit."

In a fixed-wing aircraft, equipment needed to meet the instrument approach case comprises: (1) Basic flight instruments, compass, horizon, turn and slip—loss of which requires diversion. (2) Straight ILS indicator—loss of which requires diversion. (3) Flight director coupled to ILS—operationally necessary. (4) Autopilot coupled to ILS—"a luxury."

For a helicopter the equivalent set-up is: (1) Basic flight instruments—usable in visual conditions only. (2) Autostabilizer—essential for instrument flight even when flight director is used. (3) Direct indicators of approach aid—"something of a conjuring trick." (4) Flight director coupled to approach aid—operationally necessary. (5) Autopilot coupled to approach aid—operationally desirable.

Thus, the authors conclude, for equal system integrity the

Matters of Moment . . . .

helicopter flight director plus approach aid must be as reliable as the aeroplane ILS installation; and the autostabilizer must be as reliable as aeroplane flight instruments. The pilot must then be able to fly unstabilized in visual conditions just as the aeroplane pilot can fly visually without flight instruments.

For scheduled operation involving instrument approaches, say the authors, automatic stability augmentation in pitch, roll and yaw is essential "and must be so arranged that no single fault will render either system inoperative." With the helicopter's unstable characteristics suppressed artificially, it is then possible to display flight director demands for the three rotor pitch controls (longitudinal cyclic, lateral cyclic and collective) which the pilot can respond to, and thereby make a controlled instrument approach on a suitable "ILS-like" approach aid. A better solution, however, would be to add the approach aid error signals into the autostabilizer for automatic approach.

The minimum flight system acceptable for scheduled all-weather helicopter operations will comprise: (a) Longitudinal cyclic pitch—series autostabilizer, duplicated or multiplexed. (b) Lateral cyclic pitch—series autostabilizer, duplicated or multiplexed. (c) Collective pitch—parallel autopilot. (d) Yaw control—parallel autopilot. Rotor r.p.m.—parallel governor. Item (a) would receive transient speed error; (b) would receive transient lateral guidance errors; (c) vertical guidance errors; and (d) heading errors.

After discussing in some detail the work that has been done by the Sperry company in these directions, the authors set out the requirements for an integrated control system covering:—

(a) Automatic stabilization about the three axes with four channels of automatic control having various modes of operation. (b) Automatic control of rotor r.p.m. (c) Flight director information for manual control. (d) A flight instrument display integrated with the above. (e) Pictorial beam deviation information when coupled to selected radio aids. (f) Air data instruments driven from a centralized air data unit.

Mission to Venus

ON the next occasion when the planet Venus is favourably placed in relation to the Earth for achieving a transfer orbit, NASA is planning to launch a "scaled-down" Mariner spacecraft on a fly-by mission. This will occur in mid-1962 and the launching vehicle scheduled is an Atlas-Agena B.

As previously mentioned in a news item on Oct. 5, it had been NASA's hope that the newer Centaur vehicle would have been ready by this period and would have been capable of launching a payload more comparable to the Venus probe fired by the Russians last February. This was stated to weigh 1,419 lb. The modified Mariner spacecraft will weigh only about 400 lb. Nevertheless, it will have a very useful rôle to play in the development of NASA's space exploration programme.

An Air Traffic Census in Britain

TO provide essential basic information for the future planning of the air traffic control system over Britain, the Ministry of Aviation is planning to conduct a regular census of all air traffic in British airspace. The first such census is to be held in the week starting on Dec. 4, and it is intended to repeat the exercise at approximately six-monthly intervals.

The initial census, which is to some extent experimental, is so organized that it will provide a series of charts showing the position of every aircraft airborne over the United Kingdom at hourly intervals for seven days. This information will come from two sources. In the case of aircraft flying in the airways and terminal-controlled airspace, it will be obtained from flight plans and the official Air Traffic Control Service records. For those aircraft flying outside controlled airspace it will come, the Ministry hopes, from individual owners and pilots.

Owners of all British aircraft will receive, before the census begins, a set of cards, one for each day, on which can be recorded the position, height and activity, each hour on the hour, of any airborne civil aircraft (including helicopters and gliders). The aerodromes of departure and destination and certain other information will be required on the cards, which have been designed for easy use in the air.

Special arrangements are being made to issue census cards to foreign aircraft which fly over Britain in the period. The Ministry has discussed its plans with, and obtained promises of help from, the A.B.A.C., B.A.U.A., B.G.A., BIATA, IATA, P.F.A., R.Ae.C., S.B.A.C. and the two airline Corporations.

The work of analysing the information received is expected to take several months and a computer will be employed to help in the analysis. Explaining the need for the census, the Ministry states ". . . now that attention is being concentrated on the problems of flight in the uncontrolled FIRs and UIRs the lack of basic information is hampering progress. It is essential that proper provision is made for the safety and, so far as it is compatible, the freedom of action of civil traffic in the FIRs and UIRs, but at the moment only vague estimates are available of how much traffic there is, where it is and what it is doing. A factual record is needed of the quantity and nature of this civil traffic and this can only be obtained by taking a census of the traffic over a limited period, repeating the process at intervals."

Bristol Aerojet in Italy

DISCUSSIONS are reported to be taking place between Bristol Aerojet and Breda Meccanica Bresciana regarding the production by the latter in Italy of a Bristol Aerojet rocket designed for meteorological research. This rocket was exhibited at the recent Salone della Tecnica in Turin. It has a length of 2.15 m., weighs 36 kg. and is said to attain Mach 4.3 at 14,650 metres.

Alitalia and Traffic Agreements

CURRENT conversations between Italy and the U.S.A. on the subject of amendments to the existing bilateral agreement on air traffic rights are reported to have reached a deadlock. The conversations have been temporarily suspended, by mutual agreement, in order to allow both sides to attempt to find a solution.

Italy is seeking the right to fly the Montreal-Los Angeles route and in return the U.S. Government is asking for certain traffic statistics. It appears that there is a complete divergence of opinion as to the interpretation and definition of the point of origin of an air journey. In the U.S. view this should be interpreted as the country in which a passenger initiates his air journey, as shown on his ticket. In the Italian view, the point of origin is the place where the passenger boards the (Alitalia) aircraft.

Because of her geographical position, Italy acts as an aerial "Crewe Junction" for a number of foreign airlines, many of which provide passengers for Alitalia's transatlantic services. The U.S. wants to know where those passengers come from; Italy does not wish to divulge this information.

An Italian delegation, headed by General Santini, the director-general of Civil Aviation, is at present visiting Thailand and Japan to negotiate traffic rights with those two countries. In the case of Thailand it is merely a question of concluding an agreement to replace the temporary permit which allows Alitalia to make a stop at Bankok on its Rome-Sydney services.

An agreement with Japan will permit JAL to stop at Rome on its Tokyo-Paris service, while Alitalia will, sometime in the new year, institute a Rome-Tokyo service.

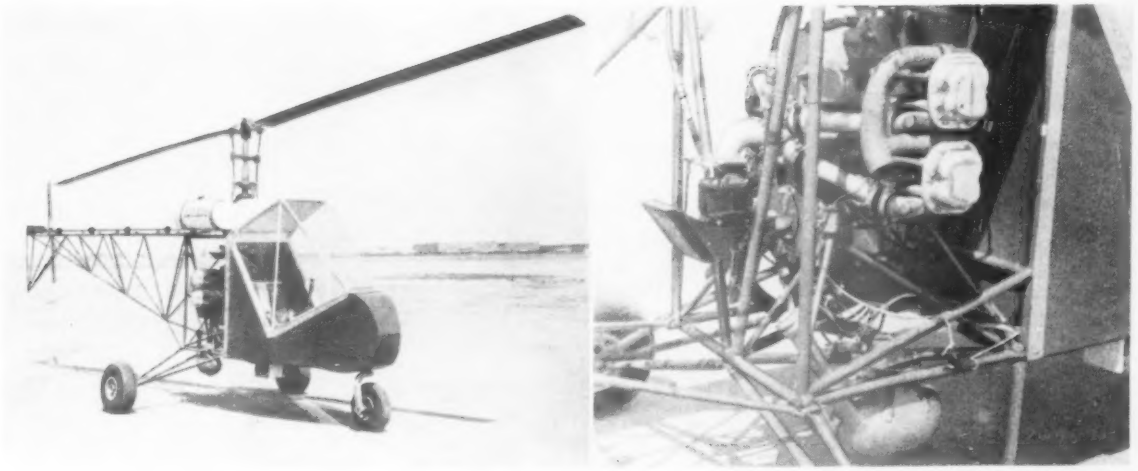
Promotions at Belfast

FROM Short Bros. and Harland comes the news that Mr. H. G. Conway, M.A., F.R.Ae.S., M.I.Mech.E., and Mr. R. E. Harvey, M.I.Prod.E., have been appointed joint managing directors of the company; since October, 1957, they have been joint deputy managing directors.

Mr. Conway, who has been with Shorts since 1954, was chief engineer of Messier Aircraft Equipment, Ltd., in Warrington, from 1938 to 1945. He then joined the Dunlop Rubber Co. as chief engineer of the Aviation Division—a post he held until 1947 when he became technical director of British Messier, Ltd. He joined Shorts as chief engineer early in 1954 and was appointed to the board a year later.

Mr. Harvey was chief planning engineer of the Pressed Steel Co. from 1939 to 1943 when he joined Shorts as chief production engineer. He became general manager in 1946 and was appointed to the board in 1953.

Mr. H. G. Conway (left) and Mr. R. E. Harvey, now joint managing directors of Short Bros. and Harland.



Howard Levy photographs

ULTRA LIGHT HELICOPTER.—The little American single-seat Commuter Junior (described below) which is powered by a Continental C.90 mounted vertically (right). It is intended for home construction.

A New Single-seater

HELICOPTER RESEARCH of Long Beach, Calif., one of several American concerns developing a low-cost helicopter for the amateur, has now produced its first commercial single-seat model. Known as the Commuter Junior, it has a vertical engine mounting to eliminate the use of bevel gears and is capable of being fitted with any Continental powerplant between 65 and 100 b.h.p.

The first Commuter Junior was powered by a Continental C-75 and made its initial flight in September, 1960. Blades are all metal, using extruded leading- and trailing-edge members and cast ribs; the fuselage is of welded steel tube. Rotor diameter is 21 ft. and chord 8 in.

Empty weight of the Commuter Junior is 600 lb., giving a useful load of 300 lb. with a gross weight of 900 lb. Top speed is 75 m.p.h.; cruising speed is 65 m.p.h.; range is 150 miles; vertical rate of climb, 500 ft./min.; and service ceiling, 10,500 ft. The latest craft to be tested is an enclosed cabin configuration powered by a Continental C-90 and having a gross weight of 925 lb.

Plans are available at a cost of $35.00 from Helicopter Research Co., Box 121, La Mirada, Calif., and kits are to be made available as well. A home-built Commuter will cost approximately $3,500; of this, $2,700 would be for parts purchased from Helicopter Research and the remainder for engine, airframe and instruments procured by the home-builder himself.

At present the craft may only be licensed as an experimental aircraft under the American amateur-built category. However, the company proposes to start certification tests as soon as finances allow.

The project started as a backyard endeavour in 1953 by a father and son engineering team who originally produced the Emigh Trojan two-seater lightplane. Their first helicopter had a coaxial twin-rotor configuration built after two years of research.

Their next machine to be built had a conventional single main rotor and a tail rotor for torque control. This craft, known as the model H-2, had a 65-b.h.p. Continental engine mounted in horizontal position with the drive unit coming off the propeller flange. Commercial clutches and free-wheeling units, V-belts and pulley drives, etc., did not prove to be very successful, however, so it was decided to design special bevel gears and a centrifugal clutch for the transmission system.

Aviation News in General

WEATHER RADAR.—The duplicate version of the Ekco E.190 airborne weather radar has been ordered for installation in the 10 Transport Command Belfast C.1s. Ekco weather radar is also to be fitted in the Comet 4C for King Saud of Saudi Arabia.

ILS SALE.—A Pye instrument landing system has been purchased for the *Centre d'Essais en Vol* airfield at Bretigny, near Paris. More than 135 ILS installations are now in World-wide use.

BOEING PROGRESS. — Boeing's Transport Division has almost completed the master models of the Model 727 sections from which tooling measurements are made, and the first production jig—for a fuselage bulkhead section—is now in use. More than 5 million man-hours of tooling work will be required to put the 727 into production; this work is being shared between the Transport, Aero-Space and Military Aircraft Systems Divisions. The first 727 will fly in the autumn of 1962 and deliveries are scheduled for late in 1963.

SKYHAWKS FOR U.S.A.F.—A large order for Douglas A4D-5s is expected to be placed by the U.S.A.F. next year, to provide Tactical Air Command with an interim close-support aircraft. Earlier versions of the A4D Skyhawk have been in service with the U.S.N. and the Marines since 1956.

GERMAN G 91Rs.—The first West German Air Force reconnaissance squadron to be equipped with Fiat G 91Rs was commissioned on Oct. 10.

HUSTLER POD TRIALS.—Among recent drop tests by the Convair Hustler has been one of the upper (weapon) component of the two-part pod from 35,000 ft. at Mach 1.6. The pod's aiming and firing mechanisms were successfully demonstrated; two distinct sonic booms—one from the aircraft and one from the pod—were heard in the area. Low-level drops of upper and lower pod components are being made from Eglin A.F.B.

TURBOFAN CONTRACT.—General Electric has been awarded an F.A.A. type certificate for the CJ 805-23B aft-fan engine. These turbojets are specified for Convair 990s and are similar to those to be used in T.W.A. Caravelle 10s.

KAMOV CONVERTIPLANE.—This new picture of the Vintokryl has been released with the news that, subject to confirmation, it has set up a new World speed record in the E-2 class. Over a 100-km. closed circuit it averaged 366 km.p.h. (227 m.p.h. approx.) bettering the 307.22 km.p.h. (190 m.p.h. approx.) attained by the Rotodyne in 1959.

FLYING FORTS.—Unusual arrivals at Gatwick on Oct. 8 were three Boeing B-17G Fortresses here to take part in the film "The War Lover."

U.S.A.F. CLOSURES . . .—Commenting on the recent statement by Mr. E. M. Zuckert, Secretary of the Air Force, that the U.S.A.F. Bases at Alconbury, Chelveston, Bruntingthorpe and Sculthorpe are to remain open indefinitely a Third Air Force spokesman told us that the run down of Alconbury for closure in 1964 was continuing and suspension of the run down of the other three was only temporary.

. . . AND MOVEMENTS.—The situation over Berlin has caused the U.S.A.F. to move eight additional tactical fighter squadrons into Germany. Two are equipped with F-104s and six with F-100s. To take their place in the U.S. three Air National Guard units, equipped with F-104s, are to be mobilized on Nov. 1. Reports say that 21 reserve squadrons and 500 aircraft have now been added to the active strength of the regular air force since the build-up began in August. Tactical aircraft are also now back in France although without nuclear armament. Two F-100 squadrons have returned to Chambley, near Nancy.

VTOL PROPOSAL.—A VTOL category change proposed by the FAA is the introduction of a "gyroplane" pilot rating to cover such types as the recently certified Umbaugh U-18 and Avian 2/180. New rating would be separate from the normal helicopter pilot rating.

NEW AIRCOUPE.—According to reports published in the U.S., a new model of the Air Products Aircoupe, with a retractable tricycle undercarriage and a 100-b.h.p. Continental 0-200-A engine, has been flying for some time.

SST DEVELOPMENT.—About 20% of NASA funds is accounted for by supersonic transport development work. Airline pilots are now being consulted on design of sub-systems; work on simulators should start soon. Sonic boom characteristics are being studied in 50 flight-tests with B-58, F-104 and F-106 aircraft at heights between 10,000 ft. and 60,000 ft., speeds from Mach 1.0 to 2.0, various angles of attack, weights and turn radii. Particular study will be made of "superboom" deriving from coalescence of multiple shock waves at a ground point and occurring during acceleration or in a wide-radius turn.

ORION CONTRACT.—Lockheed has announced the receipt of a $92,700,000 U.S. Navy contract for the P3V-1 Orion. Planned procurement of this type during the 1962 fiscal year is 36. One prototype and two production aircraft are flying.

SEA SAFETY.—On Monday, Oct. 16, more than 70 foreign air attachés and high-ranking officers of the various NATO air forces attended a joint demonstration of the Martin-Baker rocket ejection seat and a new automatic dinghy about 300 yd. off-shore from Lee-on-Solent, Hants. The demonstration, held in conjunction with the Royal Navy, Walter Kidde, and R.F.D., showed that after initiation of the ejection sequence, it was possible for a pilot to be lowered by parachute, have his dinghy inflated and to be lifted out of the water into it automatically.

HIGH FLIER.—An X-15 research aircraft with Major Bob White at the controls established a new unofficial World altitude record on Oct. 11 by reaching a height of 215,000 ft., more than 40 miles. Maximum speed was 3,477 m.p.h. Figures have yet to be confirmed.

SLAV SABRES.—About 130 North American F-86D Sabre all-weather fighters are being sold to Yugoslavia by the United States. The Yugoslav Air Force has been operating Canadair Sabre day-fighters and Republic F-84Gs supplied under earlier American aid programmes, but there have been no grants from the U.S. since 1957.

NO SPUTNIK.—Signals detected as coming from a satellite on a frequency of 20.005 Mc/s. last week-end gave rise to reports in Japan and Germany that Russia had probably launched Vostok III. Later, the Smithsonian Astrophysical Observatory announced that the signals originated from Discoverer XXXII launched on Oct. 13.

SYSTEMATIC MISSILE FIRING.—Like the Marine Corps the U.S. Army now has a helicopter-transportable air defence system for co-ordinating the fire of widely dispersed missile batteries. The system, developed by Hughes, is known as the "Helilift" and is used with Nike and Hawk SAMs.

SCOUT LINE-UP.—Part of the assembly line at Eastleigh of pre-production Westland Scouts.

Commercial Aviation Affairs

CARAVELLE NEWS.—Panair do Brasil is expected to announce an order for Caravelles shortly. The 100th Caravelle will be rolled out at Toulouse this month. Two new versions of the Caravelle have been reported. Both with the longer fuselage of the Caravelle XA (TWA version, CJ805-23B) and XB (JF8D-1), they are the XC (high density, 99 passenger, Avon 533) and the XD (Rolls-Royce RB.174).

ATLANTIC AUGUST.—Key figures just issued by IATA for its scheduled North Atlantic traffic in August show a continued decline in growth. The total for the month was 237,468—a 2.2% increase on the passengers carried in August, 1960. The passenger load factor was 52.4% (68.4% in 1960). August freight carryings, at 5,787 tonnes, however, showed an increase of 55.2% on the same month of 1960. About 1,000 tonnes of this total was accounted for by the airlift to Egypt of Sevin insecticide (see our issue for Sept. 7).

INDEPENDENT CHANGE.—Eagle Star Insurance has acquired a share in Air Couriers, Ltd., and has appointed a director to the board. Two other directors have also been appointed, to join the original Air Couriers directors, Mr. F. W. Griffith and Mr. C. P. Godral. Air Couriers is constructing a 90,000-sq.-ft. engineering base at Gatwick Airport, where it has a 50-year building lease on a 5¼-acre site. Eagle Star has an 11.8% interest in British Aviation Services, the parent company of Silver City Airways.

HELICOPTER RECORD.—Los Angeles Airways has achieved an average utilization of 4 hr. 50 min. per operating day with its S-62 turbine helicopter. Leased from Sikorsky to obtain turbine operating experience prior to the introduction of the larger S-61Ls later this year, the S-62 suffered less than one mechanical delay per 100 flight hours.

CARIBBEAN CHANGES.—Transportation Corp. of America, owners of Trans-Caribbean Airways, has purchased a 16.18% interest in Caribbean Atlantic Airways (Caribair) from Mr. H. L. Kimelman, who is the largest private shareholder in Leeward Islands Air Transport, a B.W.I.A. subsidiary. Payment was made to Mr. Kimelman in Transportation Corp. shares.

CORONADO TESTING.—F.A.A. testing of the Convair 990 Coronado began in mid-September, and Convair have now set the end of the year as the target for full certification. Five aircraft are allocated to the programme, including one for flutter, stability and control testing and two for performance. Initially the Coronado will be certificated for a gross weight of 247,000 lb. American Airlines will accept 15 aeroplanes, starting in December, with an initial performance of 584 m.p.h. at 21,200 ft., and will start service in February. If speed can be increased to 620 m.p.h. at maximum thrust, five more will be purchased.

TERMINAL FOUNDATION.—The foundation stone for B.E.A.'s £3,500,000 air terminal was laid by Lord Douglas on Oct. 3. Adjacent to the existing temporary terminal in the Cromwell Road, the new terminal will be ready for use by the summer of 1963.

SUBSIDY WANTED.—Braniff Airways has filed an application with the C.A.B. for a $1.3 million annual subsidy for operations on its route to Latin America. Braniff has made a loss on these routes each year since 1957, when it last received a C.A.B. subsidy. Pan American and Panagra have both already filed for subsidies on the Latin American operations on which they, too, suffer a loss.

LONG LIFE.—Pratt & Whitney JT4 turbojets may now be operated for 2,000 hr. between overhauls by T.W.A. in Boeing 707s.

POLISH STYLE.—A striking blue and white colour scheme has been adopted by the Polish airline LOT for its Il-18s. This one was photographed at Gatwick recently.

VINTAGE VEGA.—Because it is largely built of wood, thus offering low radar reflectivity, this Lockheed Vega has been called out of retirement to help test new ground radar equipment in the U.S. Built in 1929 it is one of four Vegas known still to exist.

F.A.A. SUPERSONIC OFFICE.—The F.A.A. has created a supersonic transport programme management office, headed by Col. Lucian S. Rochte, U.S.A.F. Col. Rochte has been on duty with the F.A.A. for two years, and will in future be the principal adviser to Mr. Halaby on SST affairs. An SST advisory group has also been formed within the F.A.A., headed by Gen. Orval Cook, U.S.A.F. (Ret.).

An-12 FOR GHANA.—With the two Viscount 838s (a third to follow) at Accra on Oct. 4, Ghana Airways also received an Antonov An-12 four-turboprop freighter.

LOSSES IN THE CONGO.—Among the aircraft destroyed in the recent fighting in the Congo, as a result of action by the Katangan Fouga Magister, were the Starways DC-4 G-APIN at Kamina on Sept. 17 and the Sabena DC-4 OO-ADN at Elisabethville on Sept. 15.

NEW SERVICE.—SAS will operate DC-8s on all intercontinental routes from Dec. 5, date of inaugural service to South America.

News About People

F.A.I. DIPLOMA WINNERS.—British recipients of Paul Tissandier Diplomas for 1960 awarded by the F.A.I. are: Mr. C. M. Newton, chairman of the Sywell Aerodrome committee; Mr. Norman Jones, founder-chairman of the Tiger Club; and Mr. Frank Irving, chairman of the British Gliding Association's technical committee.

H.S.A. APPOINTMENT.—Mr. A. Laurence has become secretary of Hawker Siddeley Aviation, Ltd., succeeding Mr. D. E. Haynes who joined Bristol Siddeley Engines on Oct. 1. A former secretary of Hawker Aircraft (Blackpool), Ltd., Mr. Laurence has more recently been with the Plessey company.

W.G.A. BOARD.—All the business of what was Armstrong Whitworth Aircraft, Ltd., and the Gloster Aircraft Co., Ltd., is now being conducted by Whitworth Gloster Aircraft, Ltd., the first phase of the merger being completed. The board of the new company comprises: Sir Roy Dobson, Sir Thomas Sopwith, Mr. H. Burroughes (chairman), Mr. W. S. D. Lockwood (managing director), Mr. C. Bayly (general manager), Mr. J. T. Lidbury, Mr. S. D. Davies, Mr. F. Martin, Mr. E. D. Keen (chief engineer, aero), Mr. F. D. Stallabrass (secretary), Mr. E. W. Shambrook (financial director) and Mr. H. W. Sidwell. Mr. Burroughes was previously chairman of Gloster Aircraft; Mr. Shambrook and Mr. Sidwell were also Gloster board members. Two former members of the A.W.A. board, Mr. H. M. Woodhams (chairman and managing director) and Mr. H. R. Watson (technical director) have retired.

NEW FAIREY DIRECTOR.—Mr. R. E. Purves, chairman and managing director of the Clyde Industries Group, one of Australia's biggest industrial concerns, has joined the board of the Fairey Co., Ltd., holding company for the Fairey Group. Since its formation in 1948 Mr. Purves has been chairman and managing director of Fairey's Australian subsidiary.

ICAO EXECUTIVES.—The Council of ICAO (its executive body) has elected J. H. Riddoch, of the U.K., Fernando Juárez Rodas, of Guatemala and Benjamin E. Martínez, of the Philippines, as its vice-presidents for the coming year. H. S. Marzusch, of the Federal Republic of Germany, has been re-elected as president of the Air Navigation Commission, Dr. Assad Kotaite, of Lebanon, as chairman of the Air Transport Committee, Nelson B. David, of the U.S.A., as chairman of the Committee on Joint Support of Air Navigation Services and D. J. Medley, of Australia, as chairman of the Finance Committee.

AVIATION MEDALLISTS.—At a ceremony on Oct. 16 Mr. Peter Thorneycroft, Minister of Aviation, presented awards on behalf of H.M. The Queen. Recipients of The Queen's Commendation for Valuable Service in the Air were: Capt. J. Nicolle, Senior Pionair Training Captain, B.E.A., and First Officer J. W. Reid, B.E.A. Helicopter Experimental Unit.

Mr. R. E. Purves, whose appointment is noted alongside.

B.O.A.C. APPOINTMENT.—The Rt. Hon. the Lord Rennell of Rodd, K.B.E., C.B., has been reappointed a part-time member of the board of B.O.A.C. until Nov. 20, 1964.

F.A.A. RETIREMENT.—Mr. James T. Pyle has resigned as deputy administrator of the Federal Aviation Agency. He has been engaged in aviation since 1935 and was administrator of the Civil Aeronautics Administration from 1956 to 1958.

Air Transport

IATA Down Under

A SPECIAL report on the Montreal supersonic air transport symposium is expected to form one of the highlights at the 17th Annual General Meeting of IATA. The meeting opens in Sydney next Monday, Oct. 23 and continues until Oct. 27. The full report, as we noted last week, is a comprehensive summary of the discussions in Montreal last April, in which more than 600 experts participated. The 300 delegates at the meeting—for the most part airline presidents, chairmen or managing directors—are expected to endorse the findings of this document, which seems destined to mould the airline industry's attitude toward the SST for the next few years.

At the opening public session of the A.G.M., Sir Hudson Fysh, chairman of Qantas, will take office as president in succession to Mr. Ake Rusck, and welcoming addresses will be given by the Australian Prime Minister and Minister of Civil Aviation.

In addition to the supersonic survey the meeting will hear, in a series of closed sessions, reports of the director general (Sir William Hildred), the executive committee and the financial, legal, technical and traffic advisory committees. A special report will be made on facilitation. Chairmen of the various committees who will be presenting these reports include H. Marking, B.E.A. (Legal); C. N. Oursler, American Airlines (Financial); R. V. Carleton, Braniff (Technical) and V. H. L. Dubourcq, K.L.M. (Traffic).

At the closing session on Oct. 27, the president-elect for 1962-63 will be confirmed. The 1962 annual general meeting will be held in Dublin and Irish International Airlines will be the host airline.

The A.T.L.B. Report

LAST WEEK, the first annual report of the Air Transport Licensing Board was published (H.M.S.O., price 1s. 3d.). Dealing with the period up to Mar. 31 (i.e., the first six months of the Board's life) the report contains a useful summary of its constitution, functions and preliminary activities. In addition, the report has provided the Board with an opportunity to place on record some general observations.

The question of insurance is raised by the Board, which points out that airlines are not able in every case to insure against their liability in respect of loss or damage to persons or property caused by their operations. The Board intends, however, to examine the arrangements made by applicants in this repect, with a view to ensuring that they are not "out of line with the best practice in the industry."

The financial status of applicants for licences is also being examined by the Board. This will take some time and meanwhile, the report notes, the grant of licences for services to be operated in the near future must, in most cases, rest upon a more perfunctory examination of financial resources than will be made later on.

On the subject of competition, the Board points out that price competition is, generally, not possible between airlines. Competition can, however, take many forms beside that of price: "the intangible quality of service is often potent in moving a passenger to travel by one airline rather than another." It is arguable, says the Board, that competition of this kind could itself lead to an increase in the total amount of air travel or to an increase of the British share of a route, provided that the inter-governmental agreement governing traffic rights permits it.

Finally, the Board warns that it will be "most reluctant" to grant licences for inclusive tours to operators who have anticipated approval by taking bookings. In the long run, the Board feels, the public will gain if the licensing system is strictly applied, although there may be some public inconvenience if licences are refused in these circumstances. Tour organizers should, the Board suggests, make a practice of naming, in their publicity, the air operator who will carry their passengers and, where possible, the type of aircraft to be used.

Ethnic Effects?

THE good financial results of Irish International Airlines (Aer Lingus/Aerlinte Eireann) during the half-year to Sept. 30, 1961, have at least one very significant feature. Unlike the majority of operators, Aerlinte Eireann did extraordinarily well on the North Atlantic, with high load factors and an increase of 55% in the number of passengers carried by comparison with the same period of 1960.

Admittedly the airline had not, last year, started to operate over the North Atlantic with its own Boeing 707-048s, but was using Seaboard and Western Airlines' L-1049Hs and crews. Even so, the results show that there are hidden ethnic effects in the way in which traffic moves. Obviously Aerlinte has been carrying a high proportion of Irish or ex-Irish passengers between the U.S.A. and their home country. El Al Israel Airlines has also been doing well, with reasonably high load factors, on its Atlantic services—and for similar reasons.

The operating surplus recorded for Irish International Airlines in the six-month period was £500,000 (£80,000 higher than that for the same period of 1960) and £320,000 of this was contributed by Aerlinte from its North Atlantic operations.

Cork Airport Opens

FIVE miles from the city centre, Cork's new airport was opened to regular airline operations on Oct. 16. It has a main 6,000-ft. N-S runway, and a secondary E-W runway 4,300 ft. long. There are four airport buildings including a two-storey terminal.

Aer Lingus and Cambrian Airways are collaborating in providing Cork-London services with Viscounts and DC-3s respectively, with some services direct and some calling at Bristol or Cardiff. Aer Lingus also is inaugurating Cork-Dublin and Cork-Paris services, and Jersey Airlines plans to link Cork with the Channel Islands as an extension of its existing Exeter and Plymouth service.

JORDANIAN VISCOUNT.—This is the first picture to show an aircraft in the markings of Jordanian, the new Jordan operator (see our issues for Sept. 28 and Oct. 12). An ex-M.E.A. Viscount, it was photographed at Beirut International Airport earlier this month.

Parachutable Airborne Equipment

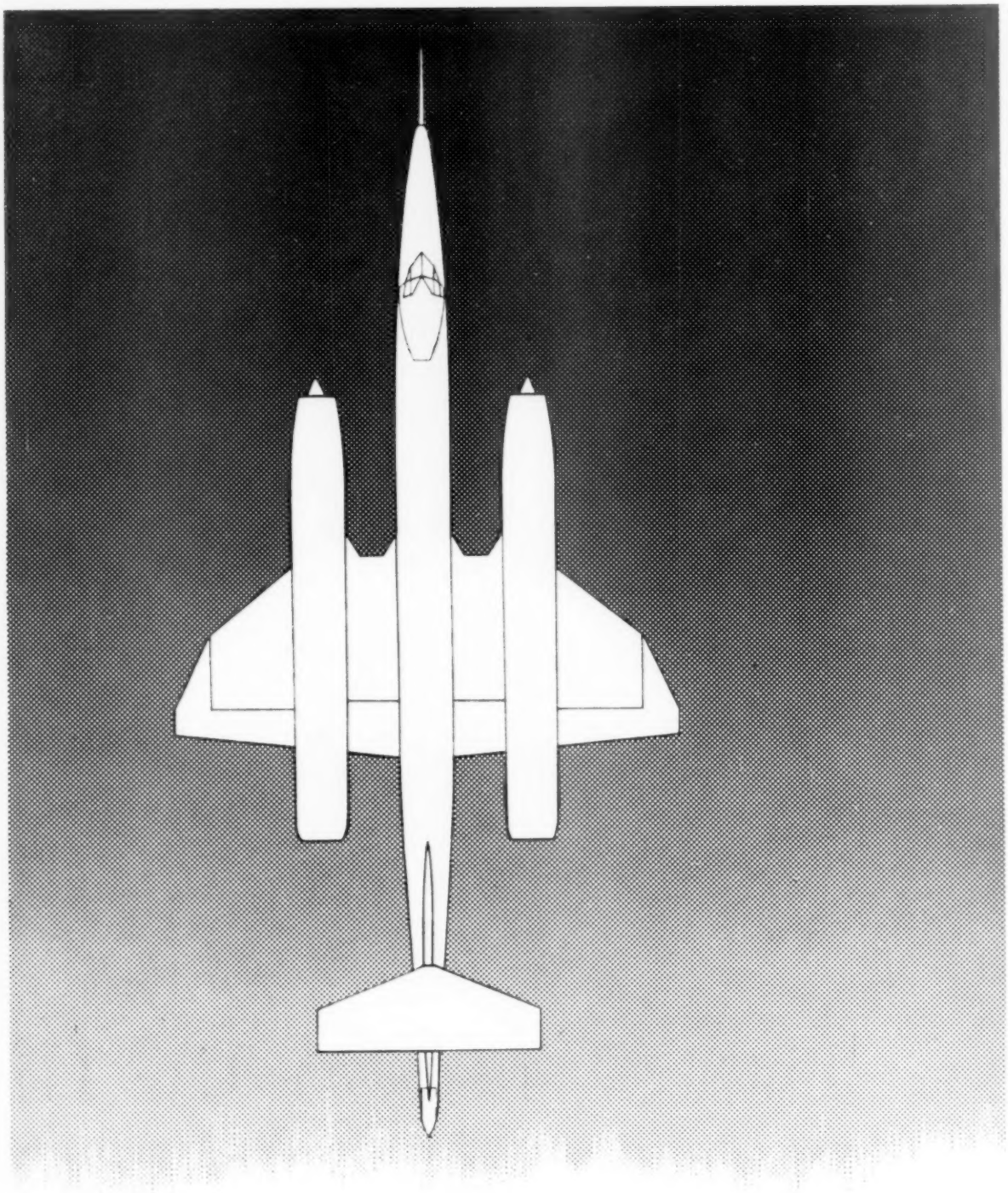
The **Blackburn** Design Team have extensive practical experience in solving the problems of mobility for the Army and of its supply by air.

HAWKER SIDDELEY AVIATION

A111

32 Duke Street, St. James's, London S.W.1

C



BRISTOL 188

Equipped with tyres, wheels, brakes, hydraulic control and anti-skid equipment by Goodyear

GOODYEAR

serving aviation the world over

AVIATION DIVISION·BUSHBURY·WOLVERHAMPTON

Air Transport . . . .

Flame-out Accident

ICING has been blamed by the C.A.B. Accident Investigation team for the crash of a Capital Airlines' Viscount near Charles City, Virginia, on Jan. 18, 1960. The 46 passengers and crew of four were killed. The Viscount was flying from Washington, D.C., to Norfolk, Virginia. It had taken off at 21.30 hrs. local and had been cruising at 8,000 ft. It had been in cloud during a substantial period of its climb and had probably been in cloud at subzero temperatures for 10-15 minutes during cruise. The freezing level was 6,000 ft.

The C.A.B. report concludes that the accident was caused by the delayed arming of the engine ice-protection systems while flying through icing conditions, causing eventual flame-out of the four engines. This condition existed, says the report, for sufficient time to cause a drop in battery electrical energy, preventing the unfeathering and relighting of sufficient engines to maintain flight. The aircraft was then dived in an effort to attain sufficient airspeed to drive the propellers out of the feathered positions by windmilling. At the same time multiple attempts were made to relight one or more engines.

Successful relights were either interrupted by auto-feather action initiated by premature advancing of the throttles prior to complete light up of an engine or prevented by insufficient battery electrical energy. No. 4 engine was eventually relit and the crew had just successfully relit No. 3 engine when the aircraft crashed.

As a result of this accident, Capital Airlines dropped the phrase "descend to warmer climate for relight" from its emergency checklist and instructed its Viscount pilots that relight could be accomplished at any altitude if proper drill were followed. Capital Airlines also adopted a system of checking pilots to ascertain that they had the benefit of the latest operating information.

Laying the Fiumicino "Scandal"

THE Italian Parliamentary Commission, appointed to inquire into the case of Fiumicino Airport, is expected to complete the first phase of its work during this month.

This Commission, which is formed by members of both the Senate and Chamber of Deputies, was appointed as a result of the "Scandal of Fiumicino"—which was at its height last January, when the new airport was opened.

A "scandal," in this sense, can be a well-used political manœuvre in Italy, designed to embarrass the government. The Fiumicino case was no exception. The government was under severe and constant attack from the left-wing Press and politicians, who alleged that the whole project was inefficiently planned and executed; that the time taken to complete it was excessive; that the site chosen was unsuitable; that the money spent was excessive; that the runways were sinking; and, for good measure, that immense profits had been made by various private interests and individuals. Some of the more sensational weeklies carried alarmist reports about the safety of the airport—all of which were quite unfounded. All this earlier excitement has long been forgotten by the public and the airport functions quite normally and entirely safely.

The report of the Commission (expected before the end of this month) will certainly revive the scandal temporarily—but should serve to put the facts into their proper perspective.

OPtional Reading—16

WITH two overshoots at Dublin, one at Boston and one at Idlewild since I began to discuss the landing case three issues ago, it looks as if corroborative evidence that a critical problem still exists will not be lacking. But in these discussions I do not propose to make any great play of individual accidents. People will fly and the aviation industry will try to earn an honest 2% of capital investment; the relationship is a voluntary one and, in a rapidly changing market, each must to some extent take the rough with the smooth. But the passenger market, like the stock market, is a sensitive, if not necessarily sensible, reactor, and if it gets too many rough rides close together the market will suffer—as, in the case of the long-haul routes, there is perhaps already some indication. So, in its own interests, if nothing else, a little soul-searching by the industry should serve a useful purpose.

Getting back to the criticality of 1.3Vs threshold speeds, it will be recalled that an aeroplane with a certification stalling speed of 100 kt. and a gross nominal threshold margin of 30 kt. above the stall could, during the round-out, experience adverse effects of stalling speed mismeasurement and *g*-loading to the combined amount of 18 kt., bringing the margin above stall from 30 to 12 kt. In the case of propeller-driven aircraft there would be a 10 kt. or so slipstream bonus above this figure, but in the case of most jets there would be no bonus. Now 12 kt. is not very much, especially when you consider that some jets run into buffet effects at stall plus 10 kt. How, then, does it come about that there are not more undershoots than there are?

The simple answer is that airline pilots are pretty shrewd characters and they do not get down to the 1.3Vs figure if they can help it. A few tried it in the early days, but, finding themselves in or very near to the high-rate-of-sink régime (and perhaps Dutch roll as well!), they took the same course as I did on the Wellington (see OPtional Reading 4) and added a few knots for mum. Lacking definite guidance, each operator adopted his own fix. For B.O.A.C.'s 707-436 all 50% flap "Ref speeds" (i.e. 1.3Vs) were upped by 8 kt. In the case of Pan American the speeds were not specially increased, but much the same effect was achieved by stressing that the rate of sink should never be greater than 700 ft./min. and by adding 1,000 ft. to all landing distances (this, of course, permitting the pilot to exceed 1.3Vs at the threshold and still not get into trouble the other end). Another U.S. solution was to build in the effect of a five-knot tailwind to the certification landing-distance measurement.

It is a pity, of course, that all these *ad hoc* adjustments had to take place, but it illustrates how easy it is for technical advance to get ahead of the certificating authorities. In this respect it should be said, however, that the advances were not so much ahead of the thinking of the authorities as they were ahead of their powers to effect remedial action, lacking as they did truly operational proof.

Anyhow, in today's jet operations the pilot tries to keep well above 1.3Vs: for one thing, even if his Flight Manual has not upped the threshold speeds, he does not have to get down to that figure till he is over the hedge; he can arrange matters on final so that most of the flare-out forces are applied when the speed is around 1.4Vs. Boeings have suggested for the 720 that there is no need to flare at all—just let the aircraft settle on the runway, using the cushion of ground effect; but I have not met any airline pilots (or passengers) who like that technique. Instead, pilots concentrate on maintaining enough speed margin to ensure that rate of sink is directly controllable by the movement of the stick; they then land the aeroplane very much as they have landed aeroplanes for the past 10 years.

As announced in OPtional Reading 14, the F.A.A. now favours 1.4Vs as one criterion for the certification threshold speed (and a 1-*g* Vs at that) and, although at the recent Washington Airworthiness Conference this met with some hesitancy by the Aerospace Industries Association, there is little doubt in my mind that it will eventually go through; so that, towards the end of 1962, certification procedures will have caught up with the practices initiated by pilots in 1960!

But the practices are not at all uniform, either by aircraft type or by individual airline. In the near future I hope to get some data on the variations, but meantime I propose to work on the estimated figure that the flare manœuvre is carried out at about 1.4Vs. At this figure the *g*s pulled would be slightly higher—say .35 instead of .3—and the apparent 40-kt. safety margin (i.e., margin above stall and/or buffet) will be eroded by 20 kt. for the combined stalling speed mismeasurement and *g*-loading effects. This gives the comparatively safe margin above stall of 20 kt. and above buffet (at, say, stall plus 5 kt.) of 15 kt. Practically speaking, the effects of both stalling-speed error and *g*-loading will, to a greater or lesser degree, always be applicable on a presently certificated jet aircraft. It now remains to examine the effects which may or may not be present—namely decay of airspeed due to wind shear or gusts, airspeed-system errors at high angles of attack, airspeed reading errors, weight errors and errors due to ground effect. But, from my present researches, it would appear that the sum of the World's knowledge of these will go on to one sheet of paper. Anyway the sum of my knowledge will; so one more number on the approach variables should be enough.

That set down, we can proceed to the interesting question of what happens to aeroplanes which, for good and substantial reasons, are consistently brought over the hedge at speeds faster than those on which certification was based.—C.C.J.

Air Transport . . .

AIRLINE PROSPECT.—The Nord/Max Holste Super Broussard is currently attracting a great deal of airline interest in many parts of the World. This picture shows the prototype in Royal Air Maroc colours; the first production Super Broussard is to fly later this year.

Runway Research Co-operation

EXTENSIVE research by the F.A.A. and NASA into the take-off and landing distances required by aircraft on wet or slush-covered runways has led to a request for help in the matter to the British Department of Scientific and Industrial Research. As a result, a three-man team from the Road Research Laboratory left for the U.S.A. on Oct. 3 taking with them a specially designed high-speed trailer (and a Jaguar XK-150 for towing purposes) with which skidding resistance studies were to be made.

Part of the American investigation called for tests of this type to be made on various kinds of runway surfaces. Since only the R.R.L. possesses an apparatus capable of taking the required measurements at speeds in excess of 100 m.p.h. the D.S.I.R. were approached for their help. The trailer unit was originally developed to study friction problems on wet runway surfaces in the U.K. On roads it has been used for similar tasks to that which it has undertaken at the National Aviation Facilities Experimental Center's Atlantic City airfield where the trials were held from Oct. 6-12.

The apparatus consists essentially of a small, light trailer the single wheel of which carries a 320-lb. load on a 16 x 4.00 tyre inflated to 20 p.s.i. It has a hydraulic disc-type brake operated servo-electrically by the driver, using a push-button switch.

Measurements of braking force between the tyre and the wetted surface are made when the test wheel is locked for one or two seconds and are recorded through a closed hydraulic system. The design of the wheel mounting is such that variations in load are not large and, therefore, need not be measured. The braking-force co-efficient is then the ratio of the braking-force to the normal load on the wheel, measured statically.

In charge of the British party was Mr. J. Masters who was responsible for field trials. With him was Mr. K. H. F. Cardew, largely responsible for the development of the apparatus, and Mr. J. K. Meads, driver of the Jaguar.

Also reported to have been at Atlantic City in connection with the series of tests were the F.A.A.'s recently acquired Convair 880-M and the Swedish Auto-Products BV.2 Skiddometer—a device for the continuous measurement of the co-efficient of friction on icy and snow-covered runways.

The Final A.T.A.C. Report

OF historic rather than current interest, the final report of the Air Transport Advisory Council appeared last week. It deals with the year ending March 31, 1961. The Council ceased to exist on July 31, and has now been superseded by the A.T.L.B.

The report provides a full account of the work of the A.T.A.C. in its final year and a list of the decisions it reached, all of which were confirmed by the Minister. Some wider comments are also made about the Council's history and, in particular, about the small use made by the public of this channel for making complaints.

When it was set up in 1947, the Council had two main duties, one of which was to consider representations from members of the public about facilities provided by the two Corporations. In 13½ years, only 59 such complaints were received. The Council remarks that this might be taken to indicate that the public is in general satisfied with the services provided.

The Report is available from H.M.S.O., price 6s. 6s. net.

DC-8 Hydraulic Modifications

AS we briefly recorded last week, the F.A.A. and Douglas have agreed on a programme of modifications to the hydraulic system of the DC-8 with the dual purpose of reducing hydraulic failures and preventing the application of asymmetric reverse thrust.

The latter has been indicated by the F.A.A. as the probable cause of the accident to a United Air Lines DC-8 at Denver last July, when 18 passengers were killed, and several other non-fatal incidents in which the aircraft have veered off the runway. There have also been a number of cases of hydraulic failures and emergency landings in DC-8s, although the F.A.A. has said that, statistically, the DC-8 is not notably worse than the other jet transports in this respect.

The modifications developed by Douglas for the DC-8 were notified to all DC-8 operators on Sept. 30, with the approval of the F.A.A. and the recommendation that they be incorporated as soon as possible by the airlines.

The DC-8 thrust-reversing system, which was designed and developed by Douglas, consists of an "ejector" forming the rear portion of the nacelle fairing, and containing eyelid reversing "buckets." For operation, the ejector slides aft and the buckets are closed across the jet exhaust, which is deflected forward. The modification now proposed by Douglas is, in effect, an interlock to ensure that the buckets are locked closed before power is applied, so that full reverse power is always obtained. The interlock system will also automatically take off power if the buckets close during flight or landing after the ejector has been moved back, and will incorporate a mechanical lock to hold the ejector in the fully open position.

Modifications to the hydraulic system include a new, independent source of back-up power for the rudder booster, independent of the system for the ground-spoiler system. Other recommendations made by Douglas are to increase the hydraulic accumulator pressure; to instal a separate accumulator for the nosewheel steering system; to add surge-damping devices or pressure-relief valves in the existing hydraulic system; to replace the hydraulic actuating cylinders for the wing flaps with newer components; to use new teflon pressure hoses on the hydraulic pumps; and to fit a new type of contents gauge for the hydraulic reservoir.

An airline briefing symposium has been organized by Douglas for Oct. 19 and 20. The F.A.A. is intensifying its supervision of airline maintenance practices to ensure the use of correct parts and procedures. For some weeks now, F.A.A. inspectors have been testing DC-8 flight crews in hydraulics-out emergency procedures, and these tests are to continue.

EIGHT POD.—A close-up of a DC-8 engine nacelle showing the so-called "ejector" moved fully aft. The thrust reversing "buckets" are open in this view.

Fares, Rates and Bilaterals

"IT is a normal foible of human nature to cling to habits which circumstances have made no longer necessary or even useful.

"International air transport may well be suffering from the same complex, and it is not impossible that the ground rules evolved at the end of the War are no longer suited to either the current situation or the shape of things to come."

These are the opening paragraphs of a recently published paper* by Mr. J. W. S. Brancker, formerly traffic director of the International Air Transport Association. In this he summarizes the history and development of international rule-making by airlines and points to some of the fundamental changes which have occurred during the past 15 years.

The Chicago Convention of 1944 was the result of discussions in an effort to establish generally acceptable rules under which international air transport could be operated. "In essence it was a battle between the 'haves' and 'have-nots' and it virtually ended in a draw."

"But, of necessity," Mr. Brancker commented, "the Conference 'ducked' the main issue of traffic rights, and the very contentious point of predetermination of frequency and capacity was left to be settled by discussion and agreement between individual countries."

The fundamental differences of opinion between the "haves," represented by the U.S.A., and the "have-nots," represented by the United Kingdom, were finally resolved in 1946 by the Bermuda Agreement "which each country undertook to use as the pattern for any subsequent agreements which might be negotiated with other countries. This agreement, which, in various forms, has received almost World-wide acceptance, was quite simply a compromise. Actual routes for services involving the territory of either party were set down and agreed . . . and, although predetermination of frequency or capacity was omitted, it was made clear that capacity should be based primarily on the requirements of third and fourth freedom traffic, and that, although fifth freedom traffic could be carried as fill-up load, post-facto reviews could be demanded by either party if they felt that too much capacity was being provided, or that fifth freedom uplifts were excessive.

Avoiding Rate Wars

"In this agreement was a definite understanding that the fares and rates charged would be agreed in the first instance by the designated carriers; failing agreement between the carriers, then it would be for the governments to reach agreement between themselves. In practice, of course, fare and rate agreements between a single pair of carriers, carried out in a vacuum, were impractical, and the conference machinery of IATA, resurrected and reconstructed from pre-War days, was called into play. But the point which cannot be forgotten is that the rights to operate were only granted on the assumption that there would be no rate war; not, let us be clear, that each carrier should charge the same, although that might be the practical result, but that each should agree to the charges made by the other."

But there have been various new factors since that time. No one, for instance, could have foreseen the growth in the number of international carriers, or the extent of their World-wide services. A more recent and profound development has been the way in which the different carriers' equipment has become standardized. Even during the era when the DC-6 and the Constellation were the principal long-haul aircraft in use throughout the World, cabin layouts had varied considerably—but to-day the big jets are almost identical inside and out (except in their colour schemes), and minor variations in sector times are obliterated by weather and A.T.C. requirements.

So, with fares held at the same level by conference agreement, and with most of the other conditions under the same strict control, there is now almost no channel left for competition in the kind of product which is being offered to the public.

"In practice, therefore, competition has become concentrated in two main fields—politics and salesmanship. This is, perhaps, an over-simplification, because there are a number of older aircraft still in operation—but the trend is clear, particularly on main-line services.

"In the political field the drive has been channelled into efforts to secure the greatest number of traffic rights . . . and at the same time to impose as many legal restraints as possible on competitors. It is in this context that the United States have changed their attitude so completely."

The process of agreeing rates through IATA "is becoming more difficult, and the adherence to agreements less strict. Once the product has been standardized, the only competitive element becomes the price; not only is it difficult to agree a single price structure against costs which vary with each carrier but, when there is any tendency towards overproduction, the temptation to undercut the agreed rates becomes aggravated.

"In the early days of IATA, fare and rate agreements were reached because the carriers wanted those agreements, and the individual carriers stuck to them for the same reason—without the need for enforcement. The agreements reached were very simple, and were written briefly to indicate intent, and without any thought as to their legal interpretation. . . .

"The resolutions reached now, however, are masterpieces of complexity, and are treated with the full significance of legal documents. There has been a considerable tendency towards over-regulation. . . .

"It is apparent, in fact, that a number of carriers no longer regard the agreements as undertakings freely and voluntarily entered into, to be respected accordingly, but feel them more to be restrictions which they have been compelled to accept against their better judgment, and which may be evaded when necessary without much moral stigma.

"The IATA carriers . . . have devoted too much time to trying to eliminate competitive practices between themselves and too little to seeking new sources of revenue.

"Another development which is symptomatic of the current situation is the growth of amalgamations and pooling arrangements. Such things . . . are a fairly natural development in the present circumstances; if the product and price are similar, co-operation to reduce costs and to improve load factors is plainly logical. . . . Moreover, the increased capital cost per aircraft, and the need for high utilization, make joint operation economically attractive. . . .

"The rigidity of the present system really leads to a concentration on ingenuity in selling; some ingenuity in operation is possible, but this is largely limited by the overall technical rules and regulations. . . .

"We are, therefore, facing a situation in which there is a definite trend towards increased Government restriction, and one in which the fares and rates machinery is straining in one direction to escape from those restrictions and in the other to suppress any competitive advantages which may be shown to exist.

Proposals for the Future

"Bilateral negotiations will always involve 'horse trading' with political undertones, but that is no great disadvantage provided that they end by giving both parties a reasonably fair deal and are not unduly restrictive. They can in practice only be negotiated on the understanding that some kind of control over the fares and rates will exist. The only kind of agreement which might eliminate this necessity would be a general undertaking that no subsidies whatever would be paid to international operators, and it is very doubtful if such an approach would be either practical, in view of the amorphous nature of subsidy, or acceptable.

"We are, therefore, left with a requirement for some kind of rate-making machinery, and . . . there is nothing to suggest that inter-government discussions . . . would lead to quicker or better results than inter-carrier agreements reached through conference machinery.

"But there is certainly room for improvement in the present IATA processes. The fear that the Association is dominated by a few large carriers must be exorcised, and more attention must be paid to the needs of the smaller operators. The basic objectives of the conference machinery (which are to make commercial agreements to avoid a rate war) have been lost in a vast pile of pseudo-legislation backed by a pseudo-police force in the shape of enforcement—and they must be revived. The fact has also been forgotten that commercial agreements are valueless unless they are entered into and applied with good will and good intent. Too much has been made of the horrors of an 'open' rate situation, and it would be well to remember that an agreement to disagree can be just as valid as an agreement to charge certain fares.

"What is basically needed is a change of heart—something which is not very easily achieved—but a combination of carrier and government action might alleviate the situation.

(*Continued on page 518*)

* "Bilateral Agreements in Air Transport": *Journal of the Institute of Transport*, September, 1961.

Air Transport . . . .

(*Continued from page 517*)

"First, all interested governments should make it clear that they will not intervene in any 'open' rate situation except in certain circumstances. These conditions would be defined as follows:—

"(1) If it could be shown that the rates charged (or the conditions offered) were definitely uneconomic for the carrier concerned over the route in question.

"(2) If at any time published or filed fares were reduced by any carrier more often than once in 12 months, unless by conference agreement.

"(3) If it was found that carriers were charging less than the fares or rates published.

"It should also be made clear that if one or any of these conditions became applicable, government intervention would certainly follow, with the indication that the carrier concerned would suffer.

"This would not prevent the airlines from agreeing to standard fares and rates for definite periods if they wished to, but, if no agreement of this kind was possible, it would be incumbent on each carrier to declare the fares and rates which he proposed charging. . . .

"An approach on these lines would permit a less rigid system than that existing today, and there would be some scope for experiments even if some carriers were not in favour of them. On the other hand the carriers could go ahead with rate-making knowing that, in the event of disagreement, there would not be a rate war, in the accepted sense of the term, nor would there be any government interference provided that certain sensible rules were observed.

"Some form of fare and rate control is necessary and can best be exercised in the first instance by the carriers. More scope must be left for individual ideas and individual skill, and agreements must be more realistic and less rigid. An attempt should be made to re-create the original concept of conference agreements, which would be more effective than an expensive enforcement system which can always be beaten when it is worth while.

"Unless airlines can survive on their legitimate routes, without recourse to breaking fare and rate agreements, more government restrictions are certain. Once restrictions are applied they are difficult to remove, even by the government applying them, and then all participants in the industry will suffer—not least the customer."

Five Year Trends in Europe

STATISTICS compiled by the Air Research Bureau, and summarized in the table below, give a useful indication of the way air traffic has been developing in Europe over the past five years. The figures cover the operations of the 13 most significant European airlines, which are members of the A.R.B. —Aer Lingus, Air France, Alitalia, B.E.A., B.O.A.C., Finnair, Iberia, Icelandair, K.L.M., Lufthansa, Sabena, S.A.S. and Swissair.

The first three lines in the table indicate the growth of passenger traffic on intra-European routes (these are routes originating and terminating within the European continent and the Near East as far as the Persian Gulf). Between 1959 and 1960, there was a 19% increase in both capacity and passenger traffic, the highest growth rate since 1955. The introduction of jet aircraft was to a large extent responsible for the increase in capacity and the continuation of this trend in 1961 is expected to bring a reduction in passenger load factor of about three points to around 54.5%. In 1960, jet aircraft provided 24% of the capacity seat-miles on intra-European routes.

Over the five years 1956-60, there have been the following increases in passenger-miles flown by the A.R.B. group of carriers, the U.S. carriers and the remainder:

A.R.B. Intra-European	14%
A.R.B. European domestic	15%
A.R.B. Intercontinental and Overseas	17%
U.S. International	12%
U.S. Domestic trunk	8%
U.S. Local service	15%
Other World airlines	16%

The European domestic figure excludes the operations of several important domestic airlines such as Air Inter in France, Linjeflyg in Sweden and the British independents. Had they been included, the European domestic growth rate probably would have been the highest of any category.

Trends in passenger revenue rates are shown in the table. The growth of economy class traffic in A.R.B. intercontinental and overseas operations is responsible for the fall in the average rate in this category. On intra-European routes, wider use of off-peak, night and excursion fares has been off-set to some extent by the growth of first-class traffic over the five years from 7.7% to 9.2% of the total.

The average stage distance per flight has continued to increase, although only by a very small amount. A continuation of this trend should, in general, benefit operating costs, while the growing number of passengers should lead to the elimination of intermediate stops in some services, also with benefit to the average stage distance.

The large increase in the average number of seats per aircraft is a direct reflection of the introduction of Caravelles and Comets (72 and 84 seats each respectively) and the growing use of high density versions of such aircraft as the Super Constellation and DC-7. As the jets flew only 18% of the total 1960 mileage, however, they have as yet had comparatively little effect on the average speed. On average, each aircraft in the A.R.B. carriers' fleets produced 13,400 seat miles per flying hour.

A factor of major importance in operating economy is traffic density, measured as the proportion of revenue passenger-miles to the number of airports served and to the total route mileage. In both these respects, there have been useful improvements. The revenue passenger-miles per carrier station increased from 7.2 million in 1956 to 9.3 million in 1960, while the passenger miles per route mile increased from 15,400 to 18,900 in the same period.

Although 1959 and 1960 have seen big increases in the growth of intra-European freight traffic (19% in each year), the growth over the period 1956 to 1961 has been exactly the same as that of passenger traffic, at 69%. Other details of freight traffic are shown in the table.

The A.R.B. report forecasts that passenger-miles completed in 1961 on intra-European routes will increase by 14% to 4,225 million but, as noted in an earlier paragraph, the average load factor will fall by about 3 percentage points. A 20% increase in capacity seat miles is forecast for 1961.

INTRA-EUROPEAN OPERATIONS, A.R.B.-MEMBER AIRLINES

	1956	1957	1958	1959	1960
Seat miles (million)	3,671	4,302	4,929	5,421	6,470
Seat miles, per cent. of previous year	—	117	115	110	119
Passenger miles (million)	2,198	2,557	2,731	3,116	3,708
Passenger miles, per cent. of previous year	—	116	107	114	119
Passenger load factor, per cent.	59.9	59.4	55.4	57.5	57.3
Average revenues per passenger mile, U.S. cents:					
ARB, Intra-European	7.56	7.78	8.13	8.06	8.00
ARB, Domestic	5.49	5.70	5.71	5.60	5.62
ARB, Intercontinental and overseas	7.68	7.50	7.36	7.12	6.81
U.S. Domestic trunk	5.27	5.24	5.58	5.80	5.96
U.S. Local	6.34	6.36	6.87	7.13	7.32
U.S. International	6.79	6.56	6.47	5.46	6.34
Average stage distance per aircraft flight, st. miles	318	328	329	333	335
Average passenger trip length, st. miles	411	433	419	428	425
"Hops" per passenger	1.11	1.13	1.12	1.17	1.16
Average number of seats per aircraft	48.3	50.0	52.0	53.3	58.9
Average aircraft speed, m.p.h.	195	202	205	217	228
Seat miles per aircraft hour (thousands)	9.4	10.1	10.7	11.6	13.4
Freight short tons/st. miles (million)	36.2	37.6	43.1	51.4	61.1
Freight revenue as percentage of total revenue	8.4	7.9	8.3	8.4	8.2
Average freight revenue rate, U.S. cents per short ton/st. mile	44.5	47.9	48.65	46.9	45.4

Problems of Aerodrome Ownership

AS we briefly recorded last week, the Aerodrome Owners Association held its annual conference this year on Oct. 5-6 at Harrogate, Leeds and Bradford. Following its now established custom, the Association had organized lecture sessions as well as visits and by all accounts the event was a most informative and enjoyable occasion.

First among the papers to be read and discussed was one by MR. J. M. WILSON, C.B., Deputy Secretary, Ministry of Aviation, who had something to say about the recent White Paper dealing with civil aerodromes and air navigational services (THE AEROPLANE AND ASTRONAUTICS, Aug. 10). His talk served as a most useful explanatory note concerning the Government's policy as set out in the White Paper and it helped to clear up many of the uncertainties in the minds of his audience.

He started by explaining that the decision of the Government to contract out of the "fascinating business of civil aerodrome management" was not because it considered that the system of State management had been tried and proved a failure; it was simply because conditions had changed. The White Paper had shown that there were only seven State-owned aerodromes compared with 25 municipally owned ones.

Common Criteria for All

Hitherto, he said, the full cost of operating these seven State-owned aerodromes had been met automatically by the taxpayers. Only a very few of the 25 municipally owned aerodromes had received any State assistance and others had been developed entirely by local resources. The essence of the White Paper policy was that all the aerodromes in this group—whether currently State owned, previously State owned or never State owned—should be put on all fours and common criteria used in judging whether they should receive any financial assistance from the Exchequer and, if so, how much.

Referring to the "stern economic challenge" with which the country is faced, Mr. Wilson said that it was vitally important that we should allocate our limited resources in the most effective way if we were to meet and surmount the challenge. It was for this reason that those paragraphs of the White Paper dealing with the question of Government aid for aerodromes emphasized that the tests would have to be strict. It would be wrong to interpret the White Paper as marking the beginning of a liberal policy.

Two main tests which would be of particular importance would be: (a) Is the aerodrome an essential link in the national transport system? (b) Is the cost of providing such an aerodrome more than the local community would reasonably be expected to bear?

In general, when it was agreed by those two tests that Exchequer aid to existing non-State aerodromes was justified, it would be related to capital development and preferably in the form of a fixed maximum sum. In this way, the taxpayers' liability was clearly defined and there was the maximum incentive to economize on the part of the aerodrome owner.

So far as any future Exchequer assistance to the present State aerodromes was concerned, the position was different in that what had to be done was to devise terms of transfer of each aerodrome that would leave the new authority, or authorities, carrying no more than a reasonable financial burden—provided always that the aerodrome satisfied the test of being one of those indispensable to the national transport system. If the aerodrome had not satisfied that test, it would have to be closed down unless the local authority was prepared to buy the land and equipment at the full market value and run the aerodrome without assistance. "This may be harsh," said Mr. Wilson, "but it is the best illustration I can give you of what the Government means by 'indispensable' as used in the White Paper."

One criticism that had been heard concerning this aspect of Government aid was that the White Paper policy drew an unfair distinction between the four main international airports, which were at present owned by the State, and the others—in the sense that the taxpayer would still be subsidizing the former while the latter would have to satisfy the strict tests before they got any help. This criticism overlooked the fact that by about the time the proposed authority was established these four airports should be breaking even: Heathrow was expected to cover its full costs in the current financial year.

En route technical services were provided by the Government and at present the cost was carried entirely by the taxpayer. Aerodrome technical services, however, were normally provided by the aerodrome owners. There were exceptions to this general pattern in the arrangements in operation at Manchester, Birmingham and Liverpool, where technical services were still run by the Ministry.

Apart from those specific exceptions, the present position was that responsibility for technical services followed responsibilities for aerodrome ownership and management, irrespective of the amount of traffic at the aerodrome or the problem of controlling that traffic in the context of air traffic control over the United Kingdom as a whole. The White Paper set out new criteria for determining the responsibility for aerodrome technical services. This was that the Government, in addition to its responsibility for providing en route service, should also provide the aerodrome services where they interacted closely with the en route services, or where other special circumstances required it. The implementation of this policy would result in some adjustments in the present pattern of responsibility.

The criteria for judging whether responsibility for the provision of aerodrome technical service should rest with the Ministry differed from the tests which an aerodrome would have to satisfy to qualify for Exchequer assistance. "It may well be," said Mr. Wilson, "that we shall need to continue to provide technical service at an aerodrome which does not qualify for an Exchequer grant and vice versa. . . .

"We recognize, however, that, where it is decided that technical service should remain with the Department, the costs to the local authority of running the aerodrome will be considerably reduced. We are, therefore, studying urgently the question of which technical services would need to remain the responsibility of the Department so that this important factor could be taken into account in the detailed negotiations about the transfer of the present State-owned aerodromes to decentralized ownership and management."

In future the taxpayer would no longer be able to look expectantly to the landing fees as the means of covering the costs of technical service which are at present provided at their expense, because the landing fees would accrue to the aerodrome owners. As stated in the White Paper the Government proposed to seek powers to levy separate charges for technical services. Statutory authority would be required for this purpose as there would no longer be the present contractual basis—through the landings on the aerodromes—between the Department and the aircraft operators.

"There is nothing," Mr. Wilson observed, "to prevent the non-State aerodrome owners from levying charges for technical services which they themselves provide. I imagine you may well hold back until the Ministry of Aviation has taken the plunge in initiating these charges, but I hope you will not be backward in adjusting your aerodrome charges of all kinds to ensure that, so far as the traffic will bear it, the cost of these expensive facilities falls upon the people who use them."

In the discussion which followed Mr. Wilson's paper, he was asked about the situation of the private aerodrome owners who offer the same facilities to the public and to the transport operators as do municipal owners—for example, at aerodromes such as Eastleigh, Sywell, Cambridge and Lympne. In reply, he said that the Ministry was well aware of the private owners' point of view and the same tests would be applied to them.

In reply to another speaker who questioned whether the fact that a local authority had been encouraged, by the Ministry, to develop an aerodrome would be considered as one of the tests of indispensability, Mr. Wilson said that the Ministry might encourage a municipality to set up an aerodrome, but this was not necessarily a criterion for financial assistance.

Rotary-wing Contributions

For the second paper of the conference, CAPT. J. A. CAMERON, manager of the B.E.A. Helicopter Unit, reviewed the development of helicopters to date and discussed future prospects. He expressed the view that it was possible that the Russians were farther ahead in this field than the Americans.

In America multi-engined helicopters with 25 seats were now undergoing tests. It was possible that these craft would be licensed for public transport in a few weeks and might possibly be in civil operation before the end of the year. If this were achieved, it would certainly represent a milestone in helicopter transport.

There were many new features to be found in the American Vertol 107. For example, it could climb vertically at the rate of 1,200 ft./min. in conditions of no wind; it was less noisy and had less vibration; and it had a higher cruising speed than helicopters at present in service. Its operating costs should also be lower, which would result in cheaper fares.

In conjunction with Sabena, B.E.A. might possibly use these helicopters on the London/Brussels/Paris/London route and this would enable the London/Paris city-centre trip to be covered in

1 hr. 35 min.—as against 4 hr. at the present time with fixed-wing aircraft. The fare for a service of this nature would probably be the same as that at present being charged; a break-even figure would be reached with 84% capacity load.

Replying to a question, Capt. Cameron said that he thought scheduled services could be operated even in poor weather conditions within the next year or two—largely due to progress made in the stability and instrumentation of the new helicopters now being manufactured.

On the second day of the Conference MR. R. S. F. EDWARDS, general manager, London Airports, dealt with the economics of aerodrome management. Airlines, he said, were the principal customers of aerodromes; they had had to face enormous development costs and only now were they beginning to emerge into really viable businesses. It had thus been impossible to recover from the airlines the full costs of the many services which the aerodrome owners had had to provide.

Just as the airlines fixed fares at low levels which the travelling public could be expected to pay so the aerodromes in turn must keep their charges to a level that the airlines could pay. This policy had inevitably meant that the aerodromes had had to be subsidized one way or another.

As the Minister of Aviation recently said: "It has been the constant policy of H.M. Government that the aerodromes should eventually become self-supporting." Last year more travellers reached the United Kingdom by air than by any other means. An industry in such circumstances could not be regarded as being in its infancy and entitled, as of some right, to a substantial subsidy.

Mr. Edwards showed an interesting table giving the main source of income and expenditure at London (Heathrow) from an analysis of the accounts for the past three years.

LONDON (HEATHROW) AIRPORT PERCENTAGE COSTS (THREE-YEAR AVERAGE)

Expenditure		Income	
Salaries, superannuation, staff training, travelling and uniform	34	Landing fees	42
Management	4	Rents and sundry recoveries from tenants, covering: electricity, gas, water, space heating, building, cleaning, laundry and sanitation, telephones, and telegraph services	23
	38		
Interest on capital	21		
Depreciation	15	Apron service-charges, parking, picketing and casual housing fees	15
Electricity, gas and water, heating fuels, rent and rates	12	Passenger service charges	10
Major and minor maintenance, building, cleaning, laundry, M.T. repairs and petrol consumable stores	9	Concessions, public admission and public car park fees	8
Telephones, telegraph services, Met. services, insurance and miscellaneous	5	Miscellaneous	2
	100		100

He explained that one reason for the high percentage of total labour cost arose from the operation of a 24-hour service, 365 days a year; another major factor was the necessity to cope with peak loads followed by periods of comparative inactivity.

Any steps which could be taken to bring about a more even flow of traffic would lead to economy in manpower. Unfortunately for the aerodrome owners the uniformity, or otherwise, of the aerodrome's utilization depended largely on the demands of the travelling public and the necessity for the airlines to dovetail their schedules into the pattern and requirements of other airports en route. A number of foreign airports were not open at night and this determined the time of departures from the United Kingdom.

On the subject of landing fees, Mr. Edwards said that in the United Kingdom these amounted to some 5-6% of the operator's average stage revenue, varying to about 10%. In the case of the long-haul operators, landing fees amounted to something like 3% of the total cost of operations. It was likely that one would have to make very drastic cuts in landing fees to encourage airlines to operate their aircraft during unpopular or uncommercial periods. This did not mean that nothing could be done to increase the utilization of an aerodrome; the airlines would naturally go to an aerodrome which provided efficient service at reasonable costs.

Interest on capital had accounted for 21% of the total expenditure and it was felt that whether or not this were actually paid, a true picture of the trading position could not be obtained unless it were included. If at Heathrow interest on capital and depreciation were not included, a profit of nearly £2 million could be shown; at Gatwick these items accounted for more than half the deficiency.

On the income side, by far the largest item was obviously that from landing fees; this was the real business of the airport. The percentage of income from rent and service from tenants at Heathrow, at 23%, was probably very much higher than at most smaller airports, but more than 50 airlines had to be provided for. Apron services, parking, etc., accounted for 15% of income and there was no doubt that a well-run apron service organization could make a useful contribution to the net return of an aerodrome.

On the subject of the much discussed passenger service charge—another major source of income—Mr. Edwards said that whilst it was, in his view, perfectly legitimate to levy part of the aerodrome charge in this form, the fact that this was done was quite often used by the airlines as an excuse for resisting payment for alterations and improvements which they wished to have carried out.

Much had been said, and written, about the alleged failure of at least the State-owned aerodromes to obtain enough revenue from non-aviation sources—such as concessions, car parks, spectators and the like. At London (Heathrow), where this side of the business had been developed "pretty vigorously," the percentage had been maintained at about 8%.

Many foreign, and some United Kingdom, aerodromes made a considerable income from the imposition of a fuel levy in some form or another. One of the main difficulties confronting the aerodrome operators in dealing with airlines was the lack of any nationally or internationally accepted basis for the rendering of aerodrome accounts. This invalidated any deductions about relative efficiencies, based purely on total costs.

When landing fees were increased recently the airlines produced a flood of figures purporting to show that these landing fees were the highest in the World. However, the services provided under the heading of "landing fee" were far more embracing than those provided by others which were quoted—the latter raising individual charges in addition to the landing fees for a number of ancillary services.

"It would be, in my view," added Mr. Edwards, "of the greatest possible value if international agreement could be reached on the services to be included in the landing fee and the services which can be charged for separately. The annual accounts would then be a yardstick of the aerodrome's efficiency and comparison would be valid."

A plea for separate aerodromes for freight traffic was put forward in a paper by MR. G. H. G. THRELFALL, managing director of Autair, Ltd., rounding off the conference lecture sessions. He presented the independent operators' viewpoint in a most interesting summary of the potentialities for charter operations in relation to passenger and freight traffic.

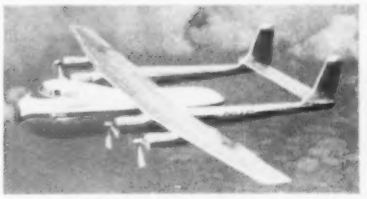
In a preliminary review of development to date, he suggested that probably the most important was the start, in 1952/53, of inclusive tours. This development had already radically altered the concept of holidays for people in England and he thought that it would continue to affect it even more in the future. Five years ago only 3-4% of the total population were able to go to the Continent for their summer holiday; this year about 6-7% will have gone. Eventually it was expected that about 20% would be able to go abroad—the majority by air, largely because the cost had now been brought within their reach.

At various times, said Mr. Threlfall, there had been proposals that separate airports should be set aside specifically for freight traffic. This was, for example, particularly so in America where some airports had reached saturation point purely on the passenger side. There were problems involved such as the question of inter-line traffic and the fact that the majority of air freight loads were still carried in the holds of passenger aircraft, as opposed to pure freight aircraft.

On the other hand, the movement of freight by air was bound to increase enormously in the years ahead and we might very well find in the future that there was justification for allocating separate airfields—other than, for example, London Airport—specifically for freight traffic. This might well provide an opening for the smaller provincial airfields, such as Luton Airport, which were easily accessible to major industrial areas and close to good road and rail communications.

Newly developing airports could not progress unless operators supported them, based themselves there and used them. The maximum support should be given to this type of development by enterprising corporations so that the country not only had the necessary major airports for serving national carriers on traffic routes, but also a number of smaller airfields that were run at no cost to the Exchequer which would allow the development of a British merchant air service. This would be to the good of the country as a whole.

Argosy's Good Start in Logair Operations



OPERATING over a 12,300-mile route network each day, Armstrong Whitworth Argosies in service with Riddle Airlines have recently been achieving an average daily utilization of 9 hr. 13 minutes per aircraft. This utilization, based on the three-month period up to Sept. 30, is a high one for an aircraft which has been in service for less than a year. Riddle are the first and, until next month, the only Argosy operators.

Riddle's whole Argosy fleet—the seventh and last aircraft was delivered recently—is allocated to its Logair contracts, which call for a daily service to be flown over three circuits originating and terminating at Tinker A.F.B., Oklahoma. These three routes serve a total of 27 U.S.A.F. bases. One route takes in the area north and west of Tinker, extending as far as Tacoma (McChord A.F.B.), Washington; a second goes to the north and east, reaching up to Loring A.F.B. in Maine; and the third is to the east and south of Oklahoma, extending to Seymour-Johnson A.F.B., North Carolina. Over these three routes, the Riddle Argosies carried over 30 million lb. of air freight and completed over 11 million ton-miles in the three months to Sept. 30.

The high utilization rate of the Argosies is attributable not only to good serviceability but also to the quick turn-round times achieved through use of double-end loading at truck-bed height, and palletized freight. In present Logair operations, the Argosy carries 10 pallets up to 88 in. wide and 59 in. long; widths up to 100 in. can be accommodated. Flat-bed trucks, 40 ft. long and specially equipped with rollers, have been used at Tinker A.F.B. to bring complete aircraft loads of freight to the Argosy, and the average loading time for 10 pallets is less than 15 minutes.

Tinker A.F.B. is the home of the Oklahoma City Air Materiel Area (OCAMA), the busiest domestic air terminal in the U.S.A.F. logistics system, serving over 30 freight flights daily to 88 U.S.A.F. bases. An automated cargo handling system has recently been installed in the OCAMA terminal, to sort and assemble freight loads for aircraft.

This system has over 6,500 ft. of electrically and electronically controlled conveyor lines moving at a speed of 48 ft./min., with 29 flight holding lines. Each item of freight is checked, by television, from one of the five monitoring stations and directed by push-button on to the appropriate flight holding line. All but 7% of the cargo handled at OCEMA can be dealt with by this system.

The terminal can load five aircraft simultaneously, and includes four telescopic, covered loading ramps which can be positioned to convey the freight from the terminal to the side loading door of the aircraft.

Riddle Airlines is one of five which are jointly responsible for the Logair operation in the present fiscal year (July 1, 1961 to June 30, 1962). The other airlines are Aaxico, World Airways, Capitol Airways and Zantop Air Transport. Starting in the current fiscal year, DC-4s have been phased out of Logair operation and DC-6As introduced for the eight flights a day on the transcontinental trunk routes. These are flown by Aaxico and World. Capitol and Zantop use C-46s exclusively for their feeder flights, and Riddle also uses some C-46s.

The Logair operation is designed to provide the U.S.A.F. and (since July this year) the U.S. Army with a guaranteed and dependable air transport system which can keep tactical units "combat ready" and speed delivery of critical and high-value supplies. It is managed by the U.S.A.F. Logistics Command Directorate of Transportation, but the contractors, who are responsible for aircraft operations, crews and maintenance, have to comply with F.A.A. and C.A.B. regulations, as well as those of the Air Force. The individual bases served are responsible for ground handling, loading and servicing.

Since its creation early in 1954, Logair has grown rapidly, as the table shows. In the current year, there are eight trunk and 20 feeder flights a day, seven days a week, over the 79,769 route miles (this figure includes duplication of flights over some routes). There are 230 scheduled departures daily from the 89 bases in the network.

LOGAIR OPERATIONS

	FISCAL YEAR						
	1955	1956	1957	1958	1959	1960	1961
Bases served	5	31	47	52	77	82	87
Aircraft miles flown (thousands)	7,120	17,617	24,201	27,732	27,827	32,851	33,087
Tonnage carried	44,598	97,828	131,309	159,278	149,203	157,190	166,661
Ton-miles flown (millions)	42.9	96.1	126.6	154.6	151.0	171.1	174.7
Cents per ton-mile	12.0	14.1	13.7	13.4	14.2	13.4	12.7

Above, one of the telescopic loading ramps at the OCAMA terminal. Below, left, a control panel for the freight sorting system and, right, some of the flight holding lines.

Flying the Swathmaster Stearman

No. 107 in the Series by John Fricker

PERCHED high on a pile of cushions, I strapped myself securely in the vast single cockpit of Boeing-Stearman Model A75-N1(Mod.), G-AROY, and peered round the big square of Perspex which comprised the windscreen. Over the long front coaming, with its loading hatch for the chemical hopper and exposed rocker-box covers of the uncowled 450-b.h.p. Pratt & Whitney R-985-AN-1 nine-cylinder radial engine, I watched Roy Slarke of Aerial Farm Services, Ltd., whose aircraft it was, initiate the starting drill.

He raised his thumb. I turned the fuel cock on, forward of the throttle quadrant on the port cockpit wall, and checked the contents indicator in the glass tube hanging down from the 46 U.S. gal. (38 Imp. gal.) centre-section tank. A big black plunger handle on the starboard panel squeezed fuel into the cylinders as the 106-in.-dia. Hamilton 2D-30 two-position prop was turned over by hand, and after half a dozen or so primes we were all set to go.

With the throttle cracked open about an inch, and the lever-type mag. switch to "both," I continued priming slowly as the bottom blade of the airscrew was hand-swung through a couple of compressions. After a throaty cough or two from the exhaust collector stub the Wasp Junior fired hesitantly, and then flicked its propeller round in a shining arc to stream a banner of fuel-rich smoke briefly back past the open cockpit and fabric-covered longerons.

Although the main purpose of my Stearman trip was in connection with the Sellers Swathmaster universal applicator for spraying or dusting, I may be excused, I hope, for succumbing to the joys offered by so potently primeval an aeroplane. With its excess of power and pleasant handling, the crop-spraying Stearman is perhaps the nearest a post-War pilot can get to flying a pre-War biplane fighter. Its engine size and British-restricted gross weight of 3,200 lb. bring it roughly into the Bulldog or Siskin class.

In the U.S., where more than 2,000 Stearmans are agriculturally employed, gross weights of up to 4,500 lb. are not uncommon with some engine installations. The Wasp Junior modification is usual, although the 550-b.h.p. R-1340 is also employed, and many Stearmans retain their original 220-b.h.p. Lycoming R-680-17 radial engines.

In all, 10,346 Stearman trainers were built, and a fair proportion have survived. Several American companies specialize in their conversion and overhaul for agricultural duties, G-AROY (the only Stearman in Europe) originating from Baxter Aircraft at Yakima, Washington.

One of the attractions of the Stearman for crop-spraying is its low initial cost, and G-AROY, completely reconditioned, had an f.a.f. price of only $7,750—rather less than £3,000. Freight and duty charges add almost 50% to that, but as delivered the Stearman is still a very cheap aeroplane.

Nor is the Swathmaster expensive. Its U.S. price is about $1,000, plus just over £100 for duty and freight, and its installation cost is equally low. It comprises what is almost an auxiliary wing of aerofoil section and made from stainless steel. This is light and of low drag, its upper surface being perforated with rows of holes, through which dust and liquid materials are dispensed by air taken in from the centre intake.

At 90 m.p.h., intake flow is 110 cu. ft. of ram air per second, which feeds past the gate at the bottom of the hopper, and carries the chemicals out along the Swathmaster "wings" and through the holes. The under-surfaces have louvres through which seed and pellets can be evenly discharged, and for high rates of application with solid material, 12 spacing bushes can be inserted to open up the entire trailing-edge to form a slot.

The Swathmaster centre-section also has an agitator box, with a slipstream-driven windmill to turn the blades in the hopper throat and keep emulsion and suspension-type liquids in circulation, as well as assuring an even flow of dry materials. The gate provides a seal for both dry and liquid chemicals, which can be distributed as necessary from the same aircraft without changing equipment. A simple cockpit lever controls the gate opening, and is readily adjustable on the ground or in flight.

Flow rates can also be varied by density of materials themselves between 1 and 180 U.S. gal. an acre, as well as by the micrometer adjustment on the dropping lever. Swath width can also be varied as desired, up to more than 60 ft. Weight of the Junior model Swathmaster on G-AROY is 90 lb., and it is used in conjunction with a 185 U.S. gal. (27 cu. ft.) Transland glass-fibre lined hopper. Normal chemical load, however, within the British gross weight is about 100 Imp. gal. (120 U.S.).

Among the several flights I made in G-AROY was one to drop some 3 cwt. prilled urea nitrogen fertilizer on oil-smeared paving stones for distribution study. After starting and run-up (with someone on the tail, because of the added weight of the Wasp Junior) at Sywell, I taxied out for take-off. Knowing that power had been almost exactly doubled from the original PT-13, my initial approach to the Stearman had been somewhat cautious. I was soon to find, however, that not only did it retain the docility one would expect from a primary trainer, but that the trim changes were very much less pronounced than in smaller and less-powerful crop-spraying types.

Cockpit appointments were as simple as in a Tiger Moth, except perhaps for the port throttle quadrant, with mixture and

pitch control knobs. Behind and to the left of the hopper gate lever was the elevator trim wheel, and that was all.

The Stearman has a permanently locked tailwheel until the application of rudder or brake, when it becomes steerable through 30° each side of centre, before castoring. One's instinctive tendency to revert to Tiger Moth practice and swing the stubby nose from side to side when taxiing to improve the forward view was easily translated into effect as the Stearman squashed smoothly along on its long-stroke oleos. In keeping the long stick hard back and using into-wind aileron and other half-forgotten tricks gained from taxiing brakeless biplanes, I noticed the exceptional lack of static friction in the controls of G-AROY, which was beautifully kept.

Acceleration, on opening up for take-off, was remarkably rapid, and the ground run negligible. I had lots of right foot ready to check a swing which never materialized. As the Wasp Junior is supercharged and, like all American engines, has no automatic boost control, care is needed to avoid exceeding the maximum sea-level power setting of 37 in. Hg and 2,300 r.p.m.

In fact, under the conditions in which I flew G-AROY, the Stearman was off the ground before anything like full power was reached, and to pull the nose up to the prescribed 80 m.p.h. climb-speed was to sample near-vertical ascent. I did not measure the climb at all, but even at 100 m.p.h., which gave a slightly more comfortable angle, the Stearman had reached nearly 1,000 ft. at the end of an 800-yd. take-off strip.

Throttling back to 32.5 in. Hg, I pulled the pitch control knob to its aft position, and the revs. fell to around 1,900 as the two-position prop went into its coarse setting. The slow-revving Wasp Junior was unexpectedly rough in cruising flight, which indicated a healthy 125 m.p.h. and seemed to bear out the low-drag claims of the Swathmaster. The Stearman proved very pleasant to fly, the slightly ponderous controls matching the general solidity of this fairly massive single-seater.

At its maximum weight, the Stearman has a manœuvre limit speed of 115 m.p.h., but most agricultural operations are done at 70-80 m.p.h. In my rather amateur attempts at dusting, I found the aircraft eminently controllable at these sort of speeds, at around 50 ft., with the Wasp Junior throttled well back and the propeller in fine pitch. Perhaps the only disadvantage under these conditions, in England, is the noise emanating from the tips of the direct-drive airscrew. Hopper-lever actuation is light and easy, except that care must be taken not to wind the micrometer adjustment to the dump position.

Low-speed docility is one of the most important features of any agricultural aeroplane, and is possessed in good measure by the Stearman. Probably because of the heavier engine, it is difficult to achieve a full stall breakaway, power off; with the stick right back and plenty of lateral control, the aircraft sinks steadily nose high at about 55 m.p.h. Slight aileron snatch is sometimes apparent, but in turbulence or a dynamic stall, a straight and brief nose drop is all that happens.

Apart from a natural nose-down attitude resulting from power reduction, trim changes are amazingly slight, even directionally between full throttle and the glide. The little elevator tab wheel is quite effective and low-geared, and can be rotated full aft to a comfortable 75 m.p.h. approach speed. The Stearman could be brought in more slowly, but it is already in a slightly nose-high attitude at 75 m.p.h., power off, which restricts the forward view. You can peer round the big windscreen (the only time you really need goggles), but a lot of experience with the aircraft would seem necessary to get it into small fields.

Other than the view problem, however, there is no difficulty in the landing. You are already halfway to the three-point attitude; elevator control remains very precise, and the Stearman runs straight on its soft oleos. I got caught out by an unexpected slope at the edge of Sywell, whose steep rise I failed to match in time with the aircraft's attitude, and although the mainwheels slammed into the ground just before the top of the ridge, the "training" oleos ironed out the impact and the Stearman did not bounce, although it bucketed a little.

With its classic biplane design, it sideslips steeply and effectively, and this might be the best way, with familiarity, of achieving the shortest approach. In its trainer form, the Stearman was very aerobatic and, although naturally restricted in manœuvre, including spins, with the agricultural gear, its control potency remains. It is also immensely robust, and should require the minimum of maintenance. In agricultural operation in England during the summer, G-AROY used only about 16 gal./hr. in fuel, which is fair enough for the amount of full throttle operation involved.

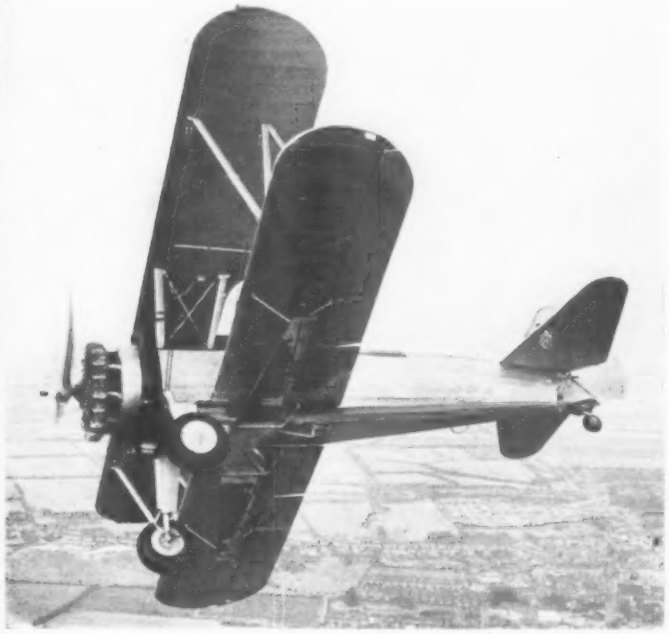
Demonstrations of the Swathmaster gear can be arranged by Aerial Farm Services, Ltd., of Holme Mills, Biggleswade, Beds, and it is also approved for installation on other agricultural aircraft down to the Piper PA-18A and Pawnee.

Leading Particulars

Dimensions.—Span, 32 ft. 2 in.; length, 25 ft.; height, 9 ft. 2 in.; wing area, 297.4 sq. ft.

Weights.—Empty, equipped, 2,300 lb.; fuel, 276 lb., oil, 35 lb.; gross weight (Gt. Britain), 3,200 lb.; agricultural gross weight (U.S.), 4,500 lb.

Performance.—Cruising speed, 125 m.p.h.; operating speed, 70-80 m.p.h.; initial climb, 1,000 ft./min.; range, 300 miles.



The overall shape and proportions of the Swathmaster chemical dispenser can be seen in this three-quarter plan view of the Boeing-Stearman Model 75. Like the Tiger Moth, the Stearman has ailerons only on the lower wings and requires the help of rudder for accurate turns.

Photographs copyright "The Aeroplane and Astronautics"

The low drag of the Swathmaster gear compared with other spraying or dusting equipment is apparent in this close-up of the sturdy Stearman. The well-sprung landing gear and responsive elevator make sweet three-pointers a simple matter.

Westland Integration

A RECENT announcement that certain sections of the Westland Aircraft's Saunders-Roe Division at Eastleigh were to be moved to Yeovil can be taken as an outward and visible sign of the physical integration of the Group that must clearly form a large part in its plans. No doubt, as time goes on, the deployment of the facilities provided by these various components will be reviewed and consolidated. The Group's chairman has, in fact, stated that its policy is to see that all the facilities within the various units of which it is now composed are used to the best advantage. Clearly, this is a programme that will take time to implement to the full; however, a general pattern already seems to be emerging and it is useful to review the current situation.

Principal responsibility for the technical affairs of the Group lies with Mr. D. L. Hollis Williams, B.Sc., F.R.Ae.S., assistant managing director (technical) with Mr. L. Boddington, C.B.E., M.I.Mech.E., F.R.Ae.S., as technical director (development), Mr. R. Hafner, F.R.Ae.S., as technical director (research) and Mr. O. L. L. Fitzwilliams, B.A.(Eng.), F.R.Ae.S., as special director and chief engineer. On the development side Capt. W. B. Axford, O.B.E., A.M.I.Mech.E., A.F.R.Ae.S., R.N. (retd.), is Group chief development engineer with Mr. J. Speechley, D.C.Ae., A.F.R.Ae.S., as chief development engineer (Yeovil). On the research side, the Group chief of projects analysis is Mr. D. M. Davies, A.F.R.Ae.S. And on the design engineering side Mr. P. E. Q. Schunker, B.Sc.(Eng.)(Hons.), M.I.A.S., A.F.R.Ae.S., is chief designer.

Mr. H. W. D. Winkworth, M.I.Prod.E., is general manager of the Fairey Aviation Division and a special director. Mr. M. H. C. Gordon is general manager of the Saunders-Roe Division and is also a special director. Mr. A. McClements, M.I.Mech.E., A.F.R.Ae.S., is deputy chief engineer of the Bristol Helicopter Division.

Naturally enough, the administrative and business headquarters of Westland Aircraft are centred at Yeovil, where too are the Westland helicopter design office and the project analysis section. Production at Yeovil is concentrated on Wessex 1s for the Royal Navy and an advanced version for the Royal Australian Navy; and Gnome Whirlwinds for the Royal Air Force and the Ghanaian Air Force. On the development side, activities are principally devoted to the Wessex 2, 3 and 5.

At Weston-super-Mare—where the Bristol Helicopter Division of the Group is located—the production side of the business is occupied with building Belvederes for the Royal Air Force and converting R.A.F. Leonides-powered Whirlwinds to the Gnome-powered version. Like other major components of the Group, Weston has been a self-contained unit and includes research, development and design facilities. For some time these have been devoted to twin-rotor helicopters—more recently, in relation to a civil version of the Belvedere and the larger Type 194 civil transport project.

It would seem logical to suppose that in the future pattern of Bristol Division activities, this sort of work would continue to be done at Weston. No doubt, this will be a matter for consideration at some later phase in the integration process; but it has already been announced that Weston will play its part in the manufacture and servicing of Vertol 107 helicopters—recently the subject of a Westland-Boeing agreement.

In the Westland Fairey Aviation Division, there is a development unit at Hayes concerned with design and technical work associated with the Rotodyne. Although this team—with Dr. G. S. Hislop, Ph.D., B.Sc., M.I.Mech.E., F.R.Ae.S., as chief engineer and special director—is in effect a separate entity, it clearly has strong cross-links with Yeovil—as indeed have other design units within the Group.

Two Westland Group products—(top) the Nimbus-powered Scout and (bottom) the Gnome-powered Whirlwind.

The present Eland-powered Rotodyne "Y" is still the subject of a comprehensive development programme, which is covered by the £4 million contract received by Westlands from the Ministry of Aviation at the time of the merger of Westland and Fairey helicopter interests. In this programme the problem of noise suppression and reduction occupies the major place. Design work on the 70-seat Tyne-powered production-type Rotodyne "Z" is proceeding apace.

As part of the policy of making good use of the Group's overall facilities, the production of the small Nimbus-powered Saro Scout for the Army has now been set up at Hayes. The first of the series came off the production line quite recently. This factory will, in fact, become the production centre for the Wasp (the generic name for the Saro P.531 and the name adopted for R.N. helicopters of this type—an order for which is expected shortly).

The complementary part of the Fairey Aviation Division at White Waltham aerodrome comprises development and production test flying units. The former is concerned with the prototype Rotodyne; the latter will deal with the Scouts and Wasps coming off the Hayes production line.

Manufacturing facilities at Eastleigh—where the Saunders-Roe Division is located—have now been given over to the building of Wessex 2 major components such as the forward portion of the cabin as a complete unit and certain sections of the under-cabin excluding the fuel tanks. These are subsequently transported to Yeovil for assembly. The development batch of Wasps was built at Eastleigh and development flying with these will continue there.

As mentioned earlier, the transfer of certain development sections from Eastleigh to Yeovil has already been initiated. This principally concerns the design and technical units and is planned as a gradual, rather than sudden, change expected to be spread over about six months. It does not, we understand, form the first step in a wholesale transfer of Westland activity from Hampshire to Somerset.—F.T.M.

Production of Gnome-Whirlwinds for the R.A.F. and Ghanaian Air Force is a major current activity at Yeovil.

ROLLS-ROYCE

SPEY

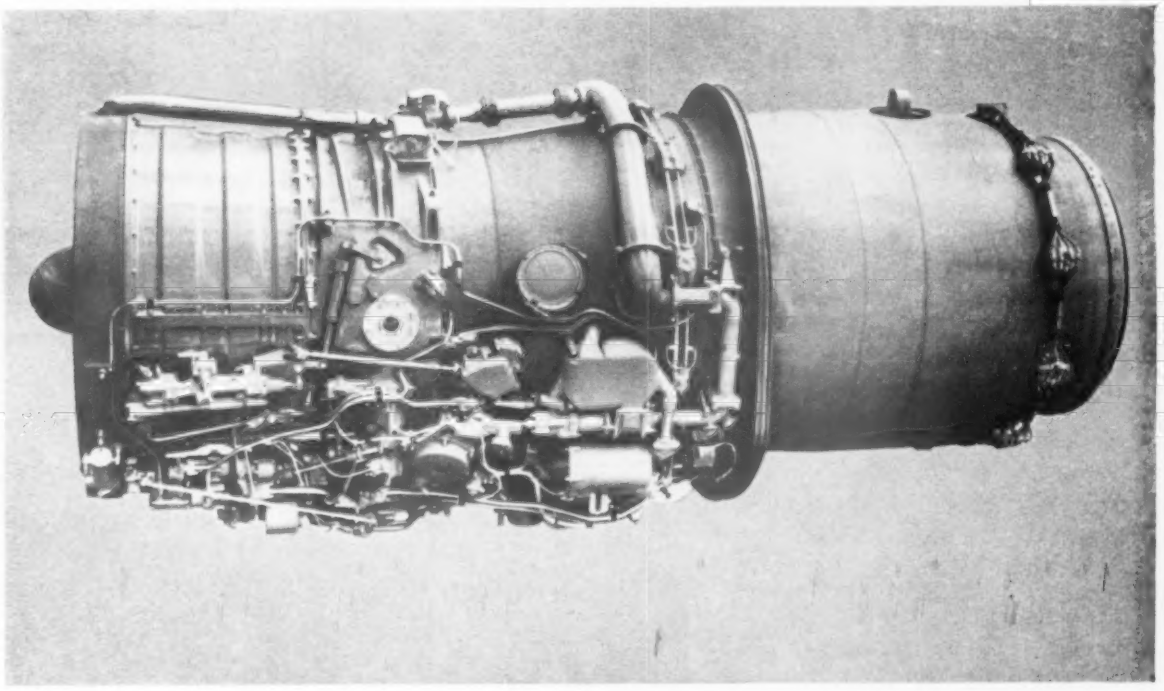
WILL POWER THE

DE HAVILLAND TRIDENT

B.A.C. ONE-ELEVEN

BLACKBURN BUCCANEER S2

BY-PASS JET



PERFORMANCE with ECONOMY—
the Spey has been designed to give low fuel consumption, low maintenance cost and long overhaul life.

AERO ENGINES · MOTOR CARS · DIESEL AND PETROL ENGINES · ROCKET MOTORS · NUCLEAR PROPULSION

Expansion creates a number of outstanding opportunities for top grade Mechanical Designers and Development Engineers.
Write to the Manager, Technical Administration, Aero Engine Division.

BRITISH AIRCRAFT CORPORATION
and
Honeywell
have formed
"INERTIAL GUIDANCE -EUROPE"

Through one
central marketing organisation
Inertial Guidance-Europe
offers the design, development
and production resources of
British Aircraft Corporation
and Honeywell in the fields of
inertial guidance systems and
miniature inertial components.

IW 7

This is a forging

Forging in Hiduminium 66 for Dowty Rotol Ltd.

H.D.A. MANUFACTURE SPECIAL FORGINGS IN MANY METALS AND ALSO CASTINGS, EXTRUSIONS, TUBES, PLATE AND SHEET IN ALUMINIUM ALLOYS FOR EVERY INDUSTRY

HDA

HIGH DUTY ALLOYS LTD · SLOUGH · BUCKS

The Fighting Services

Middle East Move

BASED at Nairobi since early 1959, No. 208 Squadron (Sqn. Ldr. M. R. Goodfellow) is to move to R.A.F. Khormaksar, Aden, in December.

When the Squadron arrived in Kenya nearly two years ago, it was planned that it should remain there on a temporary basis until such time that Khormaksar could provide the facilities required for operating two Hunter FGA.9 squadrons. These facilities are now available and No. 208 will join No. 8 Squadron on a permanent basis.

The move is intended to improve the operational efficiency of the Air Forces Middle East since the two squadrons will be able to operate as one within the existing Wing structure at R.A.F. Khormaksar while, from a maintenance point of view, the problem of having to provide spares for two Hunter squadrons stationed so far apart will be overcome.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. E. Plumtree, O.B.E., D.F.C., to the Department of the Chief of the Air Staff; Wg. Cdr. W. D. Reid, M.B.E., to the Department of the Air Member for Supply and Organization.

Bomber Command: Gp. Capt. I. R. Campbell, A.F.C., to R.A.F. Marham to command; Gp. Capt. C. J. G. Ferguson to Headquarters as Senior Equipment Staff Officer; Wg. Cdr. M. J. Beetham, D.F.C., A.F.C., to Headquarters as Group Captain, Training, with acting rank of Gp. Capt.; Wg. Cdr. D. L. Hart to Headquarters for radio (ground) duties; Sqn. Ldr. U. L. Burberry to R.A.F. Honington to command No. 90 Squadron with acting rank of Wg. Cdr.; Sqn. Ldr. G. Ibbotson to R.A.F. Coltesmore to command the Administrative Wing with acting rank of Wg. Cdr.

Fighter Command: Gp. Capt. A. N. Davis, D.S.O., D.F.C., to R.A.F. Leuchars to command; Gp. Capt. W. L. Jones, D.F.C., to Headquarters, No. 12 Group, as Senior Officer, Administration; Wg. Cdr. G. D. Cooper, M.B.E., to Headquarters for mechanical transport engineering duties.

Coastal Command: Wg. Cdr. W. Beringer to Headquarters as Group Captain, Plans, with acting rank of Gp. Capt.; Sqn. Ldr. P. M. Harvey to Headquarters for training duties, with acting rank of Wg. Cdr.

Flying Training Command: Wg. Cdr. A. J. Moody to Headquarters for administrative planning duties.

Technical Training Command: Gp. Capt. R. C. Fordham, O.B.E., to No. 1 School of Technical Training, Halton, as Senior Training Officer; Wg. Cdr. W. T. Blanchard to Headquarters No. 22 Group for training duties.

Signals Command: Gp. Capt. I. S. Smith, C.B.E., D.F.C., to Headquarters as Group Captain, Air; Gp. Capt. R. A. Webster to Headquarters as Senior Officer, Administration.

Near East Air Force: Wg. Cdr. P. N. Kingwill to Headquarters for administrative planning duties; Sqn. Ldr. J. B. Jay, to R.A.F. El Adem to command the Administrative Wing with acting rank of Wg. Cdr.

Far East Air Force: Wg. Cdr. J. M. Ayshford, D.F.C., to Headquarters, No. 224 Group, for operations-training duties; Wg. Cdr. A. E. Harkness, A.F.C., to R.A.F. Changi to command No. 205 Squadron; Wg. Cdr. M. F. Hatton, O.B.E., to Headquarters.

U.S.A.F. Exercise Participation

COMMANDED by Gp. Capt. H. Burton, a force of Bomber Command Vulcan B.2s has been taking part in the recent joint U.S.A.F. Strategic Air Command-North America Air Defense Command air defence exercise "Skyshield II." Normally based at R.A.F. Scampton, the V-bombers, belonging to No. 27 Squadron (Wg. Cdr. V. N. Cramer) and No. 83 Squadron (Wg. Cdr. R. J. Davenport), have been operating from other stations for their simulated attacks on targets on the North American continent.

In the United States at the time of the U.S.A.F. exercise were the C.-in-C., Bomber Command, Air Marshal Sir Kenneth Cross, and the C.-in-C., Technical Training Command, Air Marshal Sir Wallace Kyle. In addition to having routine talks with the Commanders-in-Chief of SAC and NORAD, Gen. Thomas Power and Gen. Lawrence Kuter, they were to visit the NORAD Combat Operations Center at Colorado Springs to see the defence system in operation.

More Service News

Squadron Standards.—Standards for four more squadrons have been approved by H.M. The Queen. These are No. 42 Squadron operating Shackletons at R.A.F. St. Mawgan; No. 52 Squadron (Valettas) of the Far East Air Force at R.A.A.F. Butterworth; No. 213 Squadron with Canberras at R.A.F. Bruggen; and No. 214 Squadron equipped with Valiants at R.A.F. Marham.

Bomber Command.—The last remaining Bomber Command Canberra squadron—No. 35 at R.A.F. Upwood—is being disbanded this month. This also marks the withdrawal from R.A.F. service of the medium-range radar bombing and navigation aid Gee-H. Introduced in its original form in 1943, Gee-H was extensively employed after D-Day when mobile ground radar stations were moved to the Continent.

No. 92 Squadron Reunion.—A reunion dinner for past and present members of No. 92 (F) Squadron will be held at the Cumberland Hotel, Marble Arch, London, on Saturday, Nov. 18. All past members who can attend are asked to contact the Squadron Adjutant at R.A.F. Leconfield, Beverley, Yorks.

Sudanese Jet Provosts.—Flt. Lt. D. McCann, deputy leader of the Central Flying School Jet Provost aerobatic team at R.A.F. Little Rissington, is leading a delivery flight of four Jet Provost Mk. 51s to the Sudan Air Force. The aircraft were due to leave Thorney Island for Khartoum last Tuesday, Oct. 17.

R.C.A.F. CL-41 Order.—The R.C.A.F. has ordered 190 CL-41 jet trainers from Canadair. Due to enter service as a basic trainer in 1963, the CL-41 has a maximum speed of 475 m.p.h., a typical training sortie endurance of 2½ hr. and a ceiling of 44,500 ft.

Operation Tucker Box.—In the recent Commonwealth Naval and Air Forces exercise in the Coral Sea area R.A.A.F. Neptunes of No. 11 Squadron from Richmond, Australia, and No. 205 Squadron Shackletons based at Singapore, logged over 50,000 miles in more than 500 hr. flying. During the exercise aircraft from both squadrons operated from R.A.A.F. Townsville in the anti-submarine rôle.

B.C.D.U. DETACHMENT.—A Valiant from the Bomber Command Development Unit at R.A.F. Finningley recently made a visit to R.C.A.F. Goose Bay, Labrador. Above, Sqn. Ldr. W. Bailey, C.O. of the permanent R.A.F. detachment at the Canadian station, is seen greeting (l. to r.) Sqn. Ldr. J. D. Jones, Sqn. Ldr. G. Currey, Wg. Cdr. W. N. Gilmer (O.C., B.C.D.U.), and Sqn. Ldr. T. Davies.

Space Tracking in South Africa

IF all goes well with the launching of Ranger II from Cape Canaveral, the first tracking stations to acquire the spacecraft as it begins its 500,000-mile journey into space will be those which have recently been completed in South Africa. The stations, located not far from Pretoria, the administrative capital, typify the continued interest which South Africa has maintained in international space programmes since the launching of Sputnik I on Oct. 4, 1957.

Much valuable work was performed by Dr. W. S. Finsen, for example, at the Union Observatory, Johannesburg, which became one of the principal centres for information on satellite orbits until the U.S.S.R. began issuing orbital data. A great deal has happened since 1957, and during that period many South African organizations have contributed to satellite, space probe and missile research programmes. These include the Council for Scientific and Industrial Research, the South African Air Force, the South African Navy, the Department of Post and Telegraphs and the Department of Foreign Affairs.

Four space-vehicle tracking stations have been operating in South Africa in recent years. These are a Minitrack station; a precision optical tracking station using a wide-angle Baker-Nunn camera; and two temporary American military stations connected with satellite projects of short-term interest, which have now departed. There have now been established an 85-ft. diameter radio-telescope near Krugersdorp which is sheltered from radio interference in a deserted Highveld valley, and a 65-ft. radio-telescope at Grootfontein Bombing Range, built on a site made available by the South African Air Force.

These are the two installations which will be engaged in tracking and receiving telemetry signals from Ranger II—if it is launched successfully—and subsequent space probes.

The Krugersdorp station forms part of the precision space-tracking system which has been established by NASA to maintain contact with spacecraft launched to great distances from the Earth. Other stations using similar equipment are established at Woomera in Australia and at Goldstone in California. Information is both recorded on tape and transmitted direct to the Jet Propulsion Laboratory in the U.S.

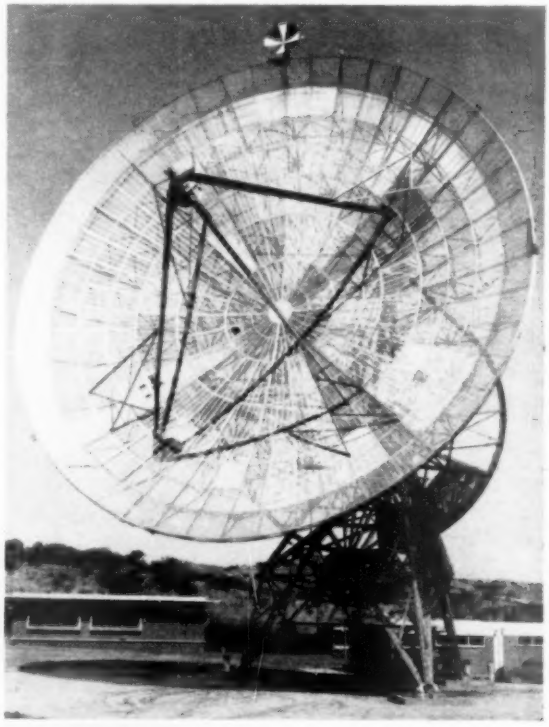
Although similar in appearance to its Krugersdorp companion, the station at Grootfontein is designed to receive telemetering information and is not concerned with providing positional data. It is capable of recording more than 300 different items of information on which a probe may be reporting and will sample 17,000 individual readings per second.

While this station is regarded as "temporary," it has been constructed in a manner very similar to its permanent counterpart. The only concession is that its instrumentation is housed in five huge trailers and that there are no residential quarters on the site. The American team which operates this equipment lives in Pretoria, some 20 miles distant, and fast sports cars parked outside the administrative offices bear witness to the need for swift transportation at any time of the day or night.

The Grootfontein station is, in fact, a military facility operated by the U.S. Air Force Missile Test Center at Patrick A.F.B., Cape Canaveral. This is, of course, the centre which operates the Atlantic Missile Range, which stretches in a 10,000-mile-long corridor between the Americas and Africa which the United States uses for military and scientific research with intercontinental missiles and rockets of many kinds. The range is managed by Pan American under U.S. Government contract, while the Radio Corporation of America—sub-contractor to Pan Am—looks after the elaborate instrumentation established on down-range islands and centres.

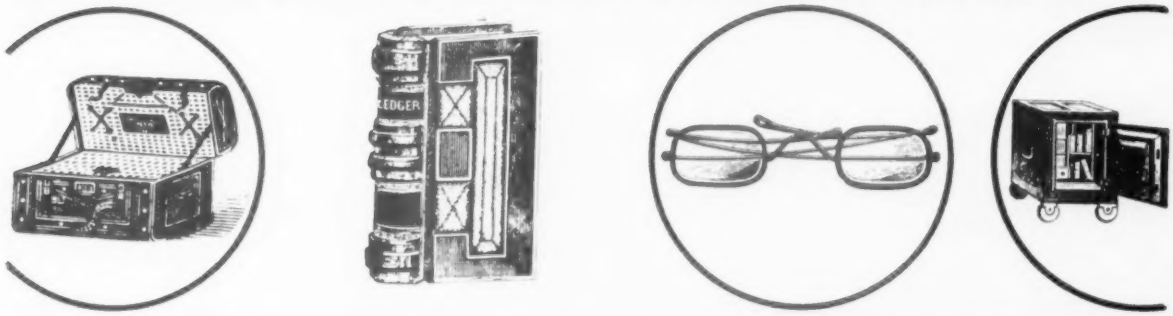
It is thus that the Grootfontein station—the most southerly

(*Continued on page 527*)



The new South African space tracking station at Hartesbeesthoek, near Krugersdorp, which was officially opened on Sept. 8. It is operated by the Council for Scientific and Industrial Research for NASA. Above, the 85-ft. steerable radio-telescope and (left) the control room.

ARE YOU blindly losing MONEY on DO it yourself GLASS FIBRE MOULDINGS?



Do you know how much each good moulding costs you to make yourself? And then the rejects? And the time? The space? The staff? Just in case you're not happy with what you find, we believe we can convince you it would pay you to let Microcell make your mouldings for you. You can stop losing money by having your eyes opened to the benefits of Microcell mouldings. Write to this address for further details: **MICROCELL LIMITED, 9 KINGSWAY, LONDON, W.C.2. COVent Garden 1262**

A SUBSIDIARY OF BTR INDUSTRIES LIMITED

WESTON Instrumental in aviation progress

ACCURATE PRESSURE INDICATION

Wherever pressures need sensing and indicating there are suitable Weston Instruments. Transmitters are available for low, medium and high pressures and are designed for use with a number of Weston indicators for fuel, oil, air and other applications.

Illustrated below is the Model S122/11 High Pressure Transmitter with separator unit, specially designed for corrosive fluids and liquid oxygen systems. Above is the Model S149 Indicator.

SANGAMO WESTON

SANGAMO WESTON LIMITED · ENFIELD · MIDDLESEX

Tel: Enfield 3434 (6 lines) and 1242 (6 lines). Grams: Sangamo, Enfield, Scottish Factory: Port Glasgow, Renfrewshire. Port Glasgow 47151. Branches: London, CHAncery 4971 • Glasgow, Central 6289 • Manchester, Central 5083 • Newcastle, 26867 • Leeds, 30867 • Liverpool, Central 6250 • Wolverhampton, 21012 • Birmingham, Midland 9118 • Nottingham, 42403 • Bristol, 21781 • Southampton, 25328. ow/116

AIRCRAFT ACCESSORIES LTD

take pleasure in announcing the purchase of the world's most comprehensive stock of C47 and DC3 spares. Large stocks available for immediate delivery.

We can almost guarantee to meet your requirements from stock.

Stocks of Exhaust, Hydraulic components, Pumps, Instruments, Electrics, consumable parts, etc.

24 hour A.O.G. Service operated. For emergency ring Deepcut 224 (Mr. Brett) or Deepcut 29 (Mr. Thornton) outside normal office hours.

Experienced Staff available for technical advice.
A.R.B. Approval No. A1/6399/61

AIRCRAFT ACCESSORIES LTD
38-40 PEABODY ROAD, FARNBOROUGH, HANTS
Phone: FARNBOROUGH (Hants) 3300-1-2 Cables: AIRCESS

Situated on the Grootfontein Bombing Range 20 miles south-east of Pretoria is this 65-ft. "dish" antenna which is designed mainly for receiving telemetry information from missiles and space-probes. The five trailers in the foreground contain supporting electronic equipment.

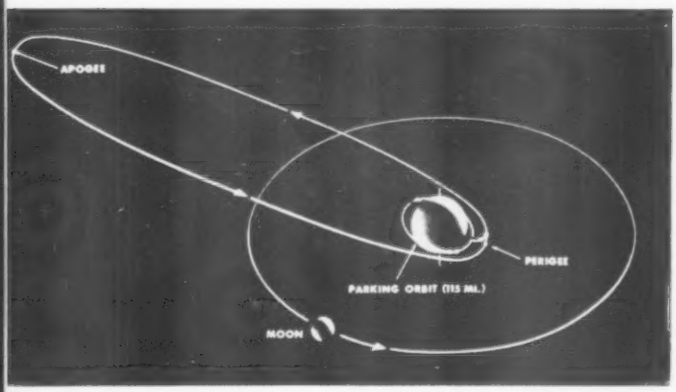
(*Continued from page 526*)

of the Range—comes under a military classification, although it is manned entirely by American civilians.

Until fairly recently missile firings from Cape Canaveral were over limited distances and the tracking station on Ascension Island was far enough down-range to track them up to re-entry into the Earth's atmosphere and down into the sea. However, when the U.S.A.F. began sending ICBMs some 8,000 miles down-range—to a target area south-east of Durban—tracking aircraft and ships had to be sent to South Africa each time a missile was due to be launched. To assist these operations, South Africa made harbour and airport facilities available, while the South African Postal Department, the Division of Civil Aviation, and the South African Air Force, co-operated by providing direct radio links between Cape Canaveral and tracking vessels, as well as providing accurate timing signals.

In recent months, however, several missiles have exceeded a range of 8,000 miles, the latest being on July 7 when an Atlas projected its re-entry head into a target area in the Indian Ocean. Although the missile was tracked by aircraft and ships near its expected point of impact, it was also followed during the latter part of the trajectory by the Grootfontein station, acting as a "back-up" telemetry receiver.

An indication that long-range firings will increase in frequency lies in the fact that American research vessels have been laying acoustic devices deep below the surface of the Indian Ocean at certain points. These will enable tracking ships to determine exact bearings for the impact point of missile nose-cones. It is likely that the re-entry head will contain a small explosive charge which will detonate under water, thereby providing the necessary impulses for accurate cross-bearings to be made in conjunction with the acoustic recorders. Probably a similar technique has been used by the Russians in registering the accuracy of missiles launched over 7,500 miles from the U.S.S.R. into the central Pacific.



Proposed orbit for Ranger II. It shows how the Agena-B stage enters a parking orbit for some 13 min. and upon reaching the optimum point in space restarts to project the probe into a long elliptical trajectory.

While the Grootfontein station will not remove the necessity for tracking ships and aircraft to observe and record the final plunge of a missile on the Atlantic range, it will provide useful support in the telemetry field. In addition to this work—and the reception of telemetered data from space probes—the Grootfontein radio-telescope is also equipped to receive signals from the experimental Midas IR-surveillance satellites.

Despite these varied activities, much of the present activity is concerned with the forthcoming launching of the Ranger II spacecraft. The intention with this vehicle is that it should first be lifted into a preliminary orbit by the top stage of the Atlas Agena-B launching rocket and then, after the carrier has been accurately positioned, its restartable engine will fire again to send the probe on a long elliptical trajectory stretching some half a million miles into space. To achieve this, it must be launched with a speed only slightly less than escape velocity (7 miles/sec.). This will make possible comprehensive measurements of the space environment for the benefit of future lunar and interplanetary missions, with particular stress on radiation, dust particles and magnetic fields.

The first of the Ranger probes launched from Cape Canaveral on Aug. 23 was unsuccessful because the Agena-B stage, having lifted the vehicle into orbit, failed to restart and enter it on the departure trajectory.

If Ranger II is successful, Rangers III, IV and V will be sent on a collision course with the Moon and will carry with them a capsule containing a seismometer. This "rough-landing capsule," which will have a 12-in.-dia. instrument sphere within a shock-absorbing fluid and balsa outer shell, is intended to detach from the main body of the spacecraft when close to the Moon. After a retro-rocket has reduced its speed, it will fall on to the surface at a few hundred miles an hour. It is then expected to start sending measurements back to Earth.

Tests have already shown that the seismometer can remain in working condition after being dropped from a helicopter at a height of 1,000 ft. On the Moon, its object will be to detect small disturbances which may occur in the lunar crust—even the fall of a meteorite.

Up to the moment of impact, the parent spacecraft will be taking close-up pictures of the lunar surface which will be relayed to Earth by television. This should give much-needed information on the nature of the Moon at close quarters without which the designers of soft-landing probes and manned vehicles would be working entirely in the dark. The largest Earth-bound telescope is quite inadequate for this purpose.

With these interesting experiments in view, the value of the tracking and telemetering equipment which has been established in South Africa, Australia and, of course, the United States, is brought sharply into focus.

After a Ranger spacecraft is launched from Cape Canaveral, the South African radio-telescope will be the first to obtain confirmation of its correct functioning. The Agena-B stage is expected to come over the Krugersdorp horizon about 28 minutes after leaving Cape Canaveral. Already looking in the prescribed direction the radio-telescope will lock-on to the probe's radio signals and will follow them across the sky until they are lost beyond the horizon. They will then be picked up at Woomera, and later by the Goldstone facility in California.

The three stations are so positioned that at least one will always be able to pick up the signals of a space probe despite the Earth's rotation.

Dwarfed by the 185 ft. tall mobile servicing gantry, the first Saturn booster stands ready on Complex 34 at Cape Canaveral.

All Set for Saturn

AFTER some initial "teething troubles," NASA announced on Oct. 15 that the first experimental launching of Saturn SA-1 would take place from Cape Canaveral "within the next several days." The main purpose of this first launching is to test the propulsion system of the first stage S-I booster, verify aerodynamic and structural design of the entire vehicle, and prove the design concept and function of the ground support and launching equipment.

In this initial test, only the first stage will be "live." It will propel two inert upper stages (S-IV and S-V) ballasted with water to simulate the weight of live stages, and a dummy payload. Object of the exercise is to launch the vehicle over a short trajectory of about 225 miles range, with a peak altitude of about 90 miles. Duration of the flight is calculated to be 8 min. and the maximum velocity about 3,700 m.p.h.

In all there are 10 research and development firings scheduled in the Saturn C-1 programme. They are expected to lead to an operational C-1 rocket in 1964, and to an advanced Saturn shortly thereafter. It is proposed to use the C-1 to orbit a three-man Apollo spacecraft around the Earth, while the advanced Saturn is expected to take a three-man crew to lunar orbit and return.

More Soviet Rocket Testing

ANOTHER "multi-stage carrier rocket of new type" was launched from the U.S.S.R. into the central Pacific on Oct. 7, according to the *Tass* news agency. It was the fourth firing in the latest series being held between Sept. 13 and Oct. 30. Previous launchings were on Sept. 13, 18 and 20, and in each case the Russians have stated that the predetermined impact point was approached very closely over a distance of more than 12,000 km. (about 7,500 miles).

Of the launching on Oct. 7, *Tass* stated: "The rocket's flight and the functioning of all its systems and stages took place fully in accordance with the prescribed programme. A new system of guidance ensured an extremely high degree of accuracy in hitting the target area.

"According to tracking information, the mock-up of the rocket's penultimate stage hit the water in the immediate vicinity of the preassigned spot. Special ships in the central Pacific, equipped with various measuring apparatus, carried out all the measurements envisaged by the programme.

"Launchings of powerful carrier rockets into the target area previously announced will be continued in order to amass further experimental data."

This was followed on Oct. 13 by a fifth firing in which all stages of the rocket "worked perfectly" over a total distance of some 7,500 miles. At the same time as this announcement was made, it was stated that the series of experimental firings was being extended to Oct. 30, 15 days longer than planned.

Speaking on Moscow Radio on Oct. 4, Prof. Dobranravov confirmed that the tests were "going very successfully . . . with striking accuracy." They were, he said, directed towards "launching objects into space. Thus, it may be supposed that in the near future, the whole World will see new and most interesting achievements by the Soviet people in the conquest of interplanetary space."

Twenty-four Hour Communications

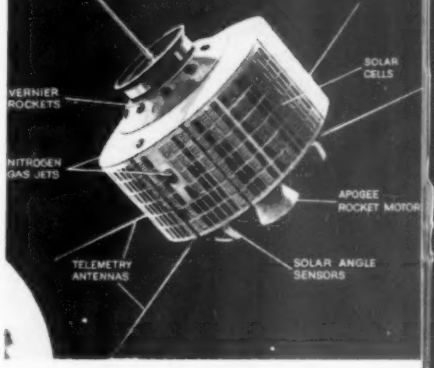
IF development proceeds as planned, NASA's first synchronous communications satellite may be in orbit before the end of next year. Under Project Syncom, Hughes Aircraft Company are to build three experimental satellites which have the double advantages of simplicity and light weight.

The design stems from research carried out during the past 18 months as a "private venture" by Hughes; this preliminary work was described in an exclusive article in THE AEROPLANE AND ASTRONAUTICS on Jan. 13, 1961, p. 44-46.

The latest appearance of the satellite is shown in the accompanying drawing. The satellite is spin-stabilized and transmits a "pancake" beam with the edge towards the Earth. As a result, there is no requirement for complex controls and a large vehicle. Syncom will be only 28 in. in diameter, and weighing 55 lb. it can be established in the desired 22,300-mile (altitude) orbit by a Delta rocket.

Despite the low cost and relative simplicity inherent in the scheme, Hughes claim that the satellite "will be fully capable of relaying telephone conversations to Europe across thousands of miles of space."

Although the intention is to launch Syncom satellites into stationary orbits above the equator, so that they match speed with the Earth's rotation and thus remain essentially "fixed" over a given area, the prototype vehicle will not be a true stationary satellite because its orbit will be inclined approximately 33° to the Earth's equator. As a result, the satellite will describe an elongated figure-of-eight pattern every 24 hr., moving 33° north and south of the equator while remaining at a fixed longitude near the east coast of the United States.



Principal features of the Hughes Syncom satellite which is being designed for a lifetime of one year.

Manœuvring Syncom into a synchronous orbit at the correct longitude probably will require several days. This is the likely sequence of events:—

After burn-out of the second stage of Delta, the satellite will be spun up to approximately 2½ revs./sec. At burn-out of the third stage, the vehicle will be at 160 miles altitude and at the perigee of an elliptical orbit. After a lapse of about 5½ hr., the satellite will have "coasted" to the 22,300-mile apogee of its orbit and will be over the Indian Ocean.

An apogee rocket motor attached to the satellite will then be fired to place the vehicle in a circular and nearly synchronous orbit. It will then drift westward to a longitude near the eastern United States. At this stage, a number of small vernier rockets will be fired to bring it to approximate synchronism with the Earth's rotation. Final precise adjustments in velocity and the vehicle's attitude in space will then be made by pulsing small nitrogen jets.

Managed by NASA's Goddard Space Flight Center, Syncom experiments will be performed by the U.S. Army's Advent Management Agency, using facilities being prepared for the military synchronous communications satellite.

Personal Flying

THIS is the time of the year for the American lightplane industry to get together with its dealers and announce the new models and sales programme for the forthcoming 12 months. Apart from rumours of several completely new models, Beech has announced an extensively revised Model 33 Debonair featuring a swept fin and many internal modifications.

Power continues to be provided by the 225 b.h.p. Continental IO-470-K engine, but the four-seat Debonair, which can cruise at 185 m.p.h., has an optional increase in fuel capacity to a maximum of 80 U.S. gal. This gives a range of 1,135 miles, including full reserves. Internal furnishings have been improved and larger brakes have been fitted.

A factory-installed "package" adding only $3,250 to the basic aircraft price of $21,975 equips the new Debonair with a full panel of gyro instruments and vacuum system, a 50-amp. generator, right-hand rudder pedals, auxiliary wing tanks, super soundproofing and Motorola T-12 ADF, plus Power Flite pilot aid. U.K. agents for Beechcraft are Short Bros. and Harland, Ltd., of Belfast.

• • •

From Thruxton comes news of a bar-opening party on October 21, with everyone welcome. With 12 training aircraft, 10 of which are Jackaroos, the Wiltshire School of Flying claims the biggest fleet of any club in England, and between Jan. 1 and Aug. 31 this year has achieved a total of 3,769.30 hours. This represents a 32% increase in flying hours over the corresponding period of 1960.

Thruxton still claims the most flying in one month—1,300 hours for August—in which a part-time instructor, Bob Smith, achieved no less than 10 hr. 35 min. dual flying in a day. Design work has progressed on the Paragon four-seater, which is intended to replace the locally produced Jackaroo; a mock-up has been built and the prototype should fly in 1962.

A tricycle undercarriage is now to be fitted to the Paragon, together with a modified canopy to permit 360° visibility, as required by the M.o.A. specification for a club trainer. The original two bracing struts for the low wing have also been changed to a single strut.

• • •

At the recent National Business Aircraft Association meeting in Tulsa, Don Payton, president of Turbo Flight, Inc., North American distributors for the Turbomeca Astazou II-powered Potez 840, said his company would deliver the feeder liner/executive transport within 18 months of order. First delivery would be made during the third quarter of 1963 on orders placed before Jan. 1, 1962.

MORE DEBONAIR.—Major external change in the 1962 Beech Debonair is the introduction of a swept fin. It also has a number of internal modifications and changes in layout.

Turbo Flight is soon expected to appoint 11 approved service stations. Spare parts and overhaul facilities for the Astazou will be provided by Continental Motors. A Potez 840 would be delivered to Turbo Flight next April for demonstration purposes. It is expected to sell for $460,000 including furnishings and radio. With four Astazou II turboprops, the 840 will be F.A.A. certificated at 19,600 lb. gross weight.

The Swiss American Aviation Corporation's SAAC.23 is to be powered by two 2,400 lb.s.t. General Electric CJ610-2Bs. Other data outlined on this passenger and/or cargo jet transport include an 11,770 lb. gross weight; 435-knot (500 m.p.h.) cruise; and a maximum cruise of 510 knots (about 600 m.p.h.).

Bill Lear, patron of the project, told the NBAA group that 25 SAAC.23s had been planned for production. The prototype is expected to fly next April, with F.A.A. certification anticipated in September. Initial delivery is planned for the first half of 1963. Lear said present plans are based on delivery of 100 aircraft in 1964, with a 25 per cent. increase each year thereafter. The basic aircraft, less radio, interior and instruments, will cost $250,000.

Tom Harris, vice-president and general manager of Aero Commander, Inc. (Oklahoma City, Okla.), indicated that two of the company's Model 1121 Jet Commander aircraft had been sold and a third was currently under negotiation. Unveiled on May 4 in New York, the twin-jet Model 1121 will be powered by two 2,850 lb. General Electric CJ610-1s.

Flight of the prototype Model 1121 is expected next May or June with F.A.A. certification by the end of 1962. The Oklahoma firm still plans to make production deliveries in the third quarter of 1963. With no electronics the Model 1121 will sell for $475,000.

By Prospector to Majorca

AN unusual aircraft for a recent holiday trip to Majorca was a Lancashire Prospector, in which a party of six found sunshine and a great deal of interest to the private pilot both during the flights and on the island. The first part of the planned route was Gatwick-Lyon (Brun)—via Lympne, east of Paris and Macone—with diversion to Dijon if necessary. The flight progressed satisfactorily at 100 m.p.h. I.A.S. and 2,000 ft. with 7/8 strat. cu. at 3,000 ft. and much less at the coast.

It seems that no trip is ever made without incident and our first shock came when the overload tank gave out 15 minutes earlier than estimated. The sudden silence as the engine almost stopped, followed by the frantic switching of tanks, cranking of wobble-pumps—and the eventual relief when the engine started again—certainly reduced the monotony of flying over the continuous flat fields of Northern France. A quick check on fuel revealed that the heavy load on the aircraft had increased consumption beyond our hopes, and we began to have our first doubts about making Lyon in one hop.

After this, fuel shortage became our main concern and we decided to hunt around for an intermediate refuelling point. The Commercial Pilot Training School at St. Yan eventually appeared and we put down on the first-class concrete runway there. About 10 gallons of fuel (at the inload rate of 7s. per gallon) were taken on—just sufficient to give the 30 minutes or so safety margin to Lyon. On arrival there, a little more than the usual mistral was blowing—crosswind, of course—and repeated warnings were given on the R/T to watch height and approach and to take care on landing. After a switchback approach we settled the Prospector down without (and we stick to it) a sign of a bounce; perhaps six up and luggage helps. It was heartening to see the Caravelle which followed us on the approach bouncing about like a Tiger Moth and to see the repeated efforts of its pilot to make the thing drop against the heat cushion of the runway. He had to go round again, and we bet he was sweating!

Tea at Lyon and then on to Barcelona. Down the Rhone valley to Ancone in a series of bumps—the mistral again—then over part of the French Massif Central. A magnificent sight. On to Montpellier, Narbonne and across the mouth of the Toulouse Gap with a north-westerly wind of 55 knots—very helpful on this course, but even more bumpy. We hit the coast again at Tossa del Mar and swept down all the way to Barcelona at a sufficiently low altitude to give us a decent view and to make the ride interesting.

We took off next day for what all pilots of single-engined aircraft will agree was the interesting bit—the 1 hr. 20 min. of water crossing. Before we started, we tested the engine in every way possible, but we need not have worried, for, as usual, it didn't miss a beat. The crossing was made at 1,000 ft. just below the haze and stra. cu. level and both pilots were pleased with the recent Link practice they had had—and also with the full panel in the Prospector. The mountains of Majorca (higher than some think at 5,000 ft.), turned up at the forecast visibility, 20 miles, and at the time calculated (the pride of the amateur). Then an interesting sweep around the bays and into the circuit at Palma St. Juan.

Sunday afternoon at St. Juan is somewhat similar to Piccadilly on Saturday evening. 10,500 people were landed there on the day we arrived (as many as, if not more than, the total number of soldiers landed by James I to capture Majorca for Christianity in A.D. 1229. Consequently one has to be very smart both on the R/T and in the circuit—a fact made evident to us while on the approach by a DC-6 skipper, who said: "Understand I am second to land but I can't see any other

Mr. H. Lawson, one of the pilots, standing philosophically by the punctured Prospector at Jersey.

aircraft before me." Reply: "Affirmative." We didn't think much of this pilot's eyesight—to us the Prospector is quite a big ship.

Thirteen days of sunshine (but always a cooling breeze), sea water at about 80° F., sailing, flying around the island, parties and more parties and very little sleep, and then preparing for the trip home, via Bordeaux and Jersey (to keep to cheap petrol). We paid our bill at the aerodrome; less than £2 for parking, landing fees, etc., during almost two weeks, aviation petrol at 2s. 3d. per gallon—Majorca is the aviator's dream island.

During our return trip we night-stopped in Bordeaux, after landing for fuel at Barcelona and Toulouse, and made an early start the next day for Jersey. Met. forecast good weather as far as the Brest peninsula, then a heavy rain belt, low cloud and a bad visibility between us and Jersey, probably breaking at 14.00 hrs. Full marks to them; at 14.00 hrs. over Rennes we hit it. Picking our way between the squalls at very low altitude we sneaked from the coast of France to Jersey.

So far the Prospector had behaved magnificently, but, as seems inevitable in small aircraft (it happened to us last year) we had a tyre burst—fortunately while taxi-ing and causing no inconvenience to anyone but ourselves. The replacement arrived 24 hours later and was fitted by Jersey Airlines in the dark; all was made ready for an early start the following day. Again bad luck—at 05.00 hrs. it was definitely not VFR, but eventually we obtained permission to go Special VFR to the Cherbourg peninsula (report when overhead by radio), on to the Isle of Wight and thence to Gatwick.

The trip was interesting; almost an hour over water to Shanklin, but we didn't even doubt the Lycoming engine now. Our concern was the weather and low cloud (very low at times), but we managed to keep in the clear and our only doubtful moments began at Goodwood (on track) where the hills were lost in cloud. We turned and, gradually flying lower to maintain contact, made along the coast to Shoreham, looking for that useful valley. Sure enough there it was, just in the clear. A quick push through and within 20 minutes we were at the end of another holiday, rushing for the London train and into the office by 10 o'clock.—R.M. AND H.L.

Gliding Notes

by Dr. A. E. Slater

"THAT gliding should be Government subsidized" was the proposal debated at the Kronfeld Club on Oct. 4, with David Carrow in the chair. Derek Piggott, chief instructor at Lasham, proposed it, Philip Wills opposed, and the seconders were both from the legal profession: Lionel Alexander, of Cambridge Club, who works for a Government service, was for; and Mike Riddell, of London Club, who is in private practice, was against.

Derek Piggott led off with the assertion that gliding is already subsidized by the rebate on the petrol tax. Several people got rather bogged down on this question later on: can it be called a subsidy if the Government takes (or some other verb) a lot of money off you and then gives you some of it back?

Piggott disapproved on the one hand of subsidizing a lot of small gliding clubs, and equally, on the other hand, of setting up a single organization like the Outward Bound School. He had noticed, during his years with the Air Training Corps, a "tremendous change" in character and confidence among the boys who passed through its gliding schools; but the Outward Bound organization, though it produces similar results, gives the boys no opportunity of continuing the same kind of activities afterwards.

Government subsidies to gliding, Piggott thought, should therefore be given to one or two gliding centres, larger than the average club, which can be run on business lines; but these larger centres would need considerable capital to make them effective. As to the fear that Government money would lead to Government control, he claimed that we have that already, for instance, in the matter of Airways, and the claims of the Ministry of Agriculture on airfields. Since they control us, why not make them pay for the privilege?

Philip Wills, opposing the motion, answered the last point by saying that it is not the Government, but the public at large, who would do the paying. Without a direct subsidy British gliding is freer from state control than that of any other country in the World.

An example of subsidized gliding, he pointed out, was that of France, where the subsidy is of the order of £1,000,000 a year. State control involves an organization of Government servants who themselves receive a large proportion of the subsidy. The Government pays a club half the cost of buying an Olympia, and an Olympia costs twice as much in France as in England.

Lionel Alexander mentioned the Judiciary and the Universities as examples of people who keep their independence in spite of receiving Government money. As to gliding, it is really subsidized in a number of ways, including private sources, a proportion of whose gifts are thereby lost to the Inland Revenue, and a firm's gliders are subsidized by people who buy its furniture.

Mike Riddell, in opposition, claimed that sports which have received subsidies have got nowhere at all, and he put the flying of light aeroplanes in this category.

Among other speakers, Wally Kahn made the point that if the Government subsidize us they will want an end-product, and if this is Youth, then we will be in the position of Iron Curtain countries in which everyone below a certain age gets free flying and the rest find it extremely difficult to fly at all. However, Betsy Woodward asked: "Why do we want all these young people coming into it? As the years go by, I want to see older people."

On the old question, whether those who want to glide can afford to do so, Derek Piggott claimed that gliding is too expensive for the average man, while Wally Kahn thought that, if people don't earn what they want to spend on such things, we will become a race of bigger morons than we are already. No one remembered Charles Ellis's estimate, made in this journal about 14 years ago, that what the average gliding man spends on his gliding is only one-third of what the average man spends on drinks and tobacco. That one-third can hardly have grown to unity yet.

The motion was put to the vote: 27 were for it and 35 against.

* * *

AN unusual lee wave at Dunstable in a W.N.W. wind, which enabled Charles Ellis to soar nine miles across wind to Barton, and waves on the same day which were used by Bristol Club members at Nympsfield, were described in these Notes on Sept. 1. They formed in advance of an approaching warm front.

Club newsletters now coming in show that waves that day, Aug. 20, were widespread over the country. Camphill had a "bit" of wave, and the Yorkshire Club at Sutton Bank produced a wave flight of 5,000 ft. in the Swallow by Roy Wilson. And now comes the Cambridge Club's latest newsletter saying that in the late afternoon of that day, "the sky over Cambridge was littered with wave clouds, a most unusual sight in this area."

John Brenner had a tow to 7,000 ft. in the Olympia and during his descent encountered wave lift at 5,000, 4,000 and finally 3,000 ft. where he maintained height for 15 minutes. He landed at 18.20, at which time the warm front had reached the Welsh Border; it passed Cambridge at ground level 9 hr. later.

This was only the second recorded wave flight over Cambridge, says the newsletter, which quotes from "Gliding and Advanced Soaring" a description of the first one, attributing it to the wrong author. It was made before the War by John Pringle, who now, it is pleasing to read, will continue as club president although he is moving to Oxford to take up a professorship of zoology.

Correspondence

"The Eye is Older than the Mind"

RECENT correspondence in your pages [issues of Sept 21, p. 413, and Oct. 5, p. 467—Ed.] about the tricks that the human eye can play when it gets a little bit puzzled reminds me of something which befell me in Victoria Station, Manchester, towards the end of the War when I was going on leave from E.F.T.S. at Sealand.

I was walking alongside a train, fully laden with kit, when I slowly spiralled to the ground for no apparent reason. When I had struggled free from the various haversacks and bric-a-brac, I realized what had happened. The train, which I had thought to be motionless, was moving very, very slowly and, as a result, I completely lost my balance.

London, E.C.1. R. A. B. COOK.

Hovercraft Licensing

MY attention has been drawn to a comment in your issue dated Sept. 28 which, under the heading "Hovercraft—Fowl or Fish?", makes reference to the application which my company has made for a Licence to operate Hovercraft in the Bristol Channel.

Your comment would appear to create the impression that our application is ill founded, ill thought out and ill conceived. In fact, had you been able to read the application, I feel you would have no doubt realized that such is far from being the case.

Since Hovercraft were first mooted, this company has been much concerned with their development and announced its intention of being interested in their operation before any other company in this country.

We have always been of the opinion that these craft are a maritime matter, but we have been informed that, for the time being at any rate, this is not the official view. In our opinion, no application for a licence should be made or granted until such time as the craft have reached a stage of development that would justify it. This is made plain in our application to the Air Transport Licensing Board.

A stranger to the Bristol Channel having made an application to operate Hovercraft on almost every possible route in the United Kingdom, it became necessary for this company to take advice as to how to safeguard its position; in particular having regard to its having been first in the field. We were advised that this could only be done by making an application for a licence and this we have done.

I would point out that this company has conveyed tens of millions of passengers in the Bristol Channel over the years and is second to none in respect as a transport concern.

Cardiff. S. C. SMITH-COX,
Managing Director,
P. and A. Campbell, Ltd.

[We are very glad to have these additional details of P. and A. Campbell's application to operate hovercraft services—the seriousness of which was in no way questioned in our Sept. 28 issue. Our criticism concerned the present licensing system for these craft and we are pleased to see that the company agree with us that this should be a maritime matter.—ED.]

Back in the Good Old Days

EVERY time I step out of the house I look skywards—it is a habit from younger years of which I have never been able to rid myself. I note the cloud base and visibility, wind speed and direction, and follow this up with the inevitable: "Nice day for flying"; or: "Thank goodness I'm not flying today!"

But for many years now I have been aware, subconsciously perhaps, of a vague sense of disappointment, and this morning the reason for this suddenly hit me between the eyes. These days you never look up and see somebody doing a roll, or a spin, or a falling leaf, or even a loop. All you ever see is a few vapour trails, thousands of feet up—and horribly straight.

Egham, Surrey. F. E. CHASEMORE.

Historical Note

I WAS most interested in the top photograph on page 458 of the Oct. 5 issue of THE AEROPLANE AND ASTRONAUTICS.

Almost directly below the tailwheel of "O5" is the site of the Poldhu wireless station used by Marconi when he carried out experiments which resulted in the first signals sent across the Atlantic, being received in Newfoundland.

When I was last there in 1947, one of Marconi's original assistants was still living in the hotel, shown in the photograph under "O2."

This aspect of the photograph came to mind because I still possess a few early wireless and television parts in addition to the remains of two 1909 Type XI Bleriots, which are due for eventual reconstruction.

I thought the matter might be of interest as developments from these original wireless experiments form an essential part of today's aviation.

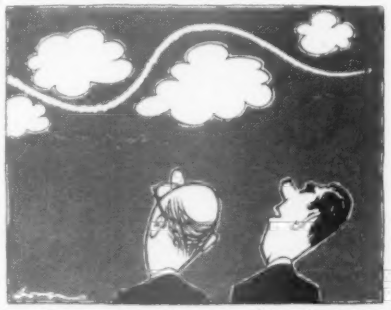
Weybridge, Surrey. R. G. J. NASH.

Wroundabout

The World's Most Experienced Caterers

PanAm captain, while taxi-ing out, speaks thus to first-class passengers: "Welcome aboard, ladies and gentlemen. While you're with us you will be served with the finest dishes specially prepared for you by Maxim's head chef. Pan American hope you will enjoy your meals with us." Then a similar welcome to the Economy Class passengers, assuring them that their food would be of the most excellent and beautifully prepared and served. Forgetting to switch off his mike he was then heard to say: "Okay, boys, let's get this restaurant airborne."

*



"Capt. Davies makes the most of his cloud warning radar."

*

Two from the Tiger Club

"Do you often come to Farnborough?"
"Oh yes, but only in the formating season."

*

"It's a superb machine for a treasure hunt—the treasure being a field—despite the fact that when you bank, the wing blots out the field so one must always have a spare field or two in hand."

*

Clubs are Trumps. The pending move of the Royal Aero Club to Fitzmaurice Place has led one member to suggest that he might be made an honorary life member. His name—Col. Fitzmaurice, one of the first three to fly the Atlantic East-to-West. To soothe members who are not taking kindly to the move, Bill Marsden, House Secretary, is going around quoting Mr. Justice Humpheries' old jingle:

"My Club, my own beloved Club
Will surely take me in,
To soothe my soul with sweet discourse
And drown my cares in gin."

*

Scramble. A new Zealand farmer complains that low-flying jets are frightening his chickens into laying misshapen eggs.

by Wren

Industry Record

Computer Research

Within the data-processing group of divisions of Elliott Brothers (London), Ltd., a special computer division has been formed to tackle the problems associated with the "on-line" application of digital computers to continuous operations. Heading the new division is Mr. S. L. H. Clarke, Elliott Brothers assistant general manager.

In a statement the company says: "No great amount of work has yet been done in this field anywhere in the World, with the result that there are many fundamental studies to be carried out in developing the new techniques required. Not least of the problems is that there may be a wide range of sources of information, such as radar signals, relayed radio messages, teleprinters and instruments of many kinds, in addition to manual keyboards, all feeding data to a computer simultaneously while at the same time it is providing outputs in the form of visual displays, command signals and the automatic logging of data. The complexity of such systems is very great and has given rise to the need for the formation of special teams of experts to study them."

As its immediate concern the division has under development an experimental air traffic control system (described in our Aero-Electronics number for July 20), an advanced airline seat-reservation system and the control and switching of telegraph communication networks.

Divisional Status

The formation of a new division is also announced by Ultra Electronics who have set up a telecommunications division headed by Maj.-Gen. E. S. Cole, formerly Director of Telecommunications at the War Office.

At its disposal the new division has specialized communication development laboratories at its headquarters at Western Avenue, Acton, supported by research laboratories, model shops and a large and well-equipped factory.

In addition the new division will be able to draw on the facilities of W.S. Electronics, Ltd., and Trix Electronics, Ltd., both of which have been acquired by Ultra in past months. The former is a specialist in the VHF/UHF communications field; Trix is concerned with audio and associated equipment.

Direct licensing arrangements have been made with several companies in the United States and on the Continent and an agreement for the interchange of technical information has been made with the U.S. Electronics Capital Corporation. This organization has the research and development facilities of 18 companies behind it.

Maj.-Gen. Cole, who will have the title of operational manager of the telecommunications division, is responsible for the co-ordination of its general activities. The facilities mentioned will continue to operate under their existing management directors. Before his War Office appointment Maj.-Gen. Cole was Deputy Chief Signals Officer to the Allied Command, Europe, and earlier still, was chairman of the British Joint Communications Electronics Board. He is also president of the Radio Society of Great Britain.

With Mr. A. V. Edwards and Dr. F. W. Stoneman, Ultra managing director and executive director, sales and engineering respectively, Maj.-Gen. Cole is, as we go to press, on a three-week sales and development exploitation tour of the U.S.

Name Change at Bracknell

In keeping with the broadening field of its activities, Racal Engineering, Ltd., has decided on a change of name and in future will be known as Racal Electronics, Ltd. The company, a manufacturer of radio communications equipment, was formed in 1951, moving to Bracknell two years later. Here it will occupy 124,000 sq. ft. when extension building is completed next spring.

Other news from Racal is that it has formed an Australian subsidiary, Racal (Australia), Pty., Ltd., to market its own and other products there. The new company will work closely with Commonwealth Electronics Pty., Ltd., of Baulkham Hills, Sydney, whose managing director, Mr. R. S. Hope, is to hold a similar position with the Racal concern.

Racal Electronics, the British parent company, is to act as marketing agents for Commonwealth Electronics in the U.K.

News from Canada's Industry

Immediate expansion of its London office into a European Systems Division is planned by Computing Devices of Canada, Ltd. This follows only a year after its establishment under the management of Wg. Cdr. L. H. Lambert.

In announcing details of the proposed expansion, the company's president and general manager, Mr. C. F. Hembery, said that the increase in status has been brought about by "the wide acceptance of C.D.C.'s products in Europe" and therefore the need to have an on-the-spot systems engineering and management organization has been felt to be necessary. C.D.C. is well known in the field of integrated navigation systems. Its position and homing indicator is fitted as standard navigational equipment in many NATO aircraft.

By having a technical staff on the "doorstep" of NATO countries the company's aim is to provide immediate assistance where and when necessary. This service will be supported by the resources of the head office in Ottawa.

In Canada itself C.D.C. is now completing the first stage of construction of an aerophysics research laboratory on a 200-acre site at Stittsville, Ont., 12 miles from the main plant at Bells Corners. It is a completely company-financed venture and claimed to be the first such privately owned facility of its kind in North America.

This step has been taken even though Canada has, at present, no major high-speed aircraft, missile or space development programmes.

HIGH REACH.—Fin servicing of a B.O.A.C. Boeing 707 from Mercury Airfield Equipment's new electrically controlled multi-level maintenance platform. Maximum working height is 40 ft.

Aviation Calendar

Oct. 19

London.—R.Ae.S. Fifth Lanchester Memorial lecture, "Ship Accompanying Waves to Shock Waves of Supersonic Aeroplanes," by R. Legendre, at 4 Hamilton Place, W.1, at 18.00 hrs.

Oct. 23

Paris.—International Airline Navigators Council, European Regional Meeting, at 30 Rue de Gramont.

Oct. 24

Glasgow.—R.Ae.S. Branch lecture by P. Gibb, at the University of Glasgow, at 19.30 hrs.

Oct. 25

Weybridge.—R.Ae.S. Branch lecture, "The Supersonic Transport," by Dr. A. E. Russell, at the Apprentice Training School, Vickers-Armstrongs (Aircraft), at 17.45 hrs.

Oct. 26

Birmingham.—British Institution of Radio Engineers, West Midlands Section lecture, "Instruments for the First United Kingdom Scout Satellite," by Prof. J. Sayers, at Birmingham University, at 18.15 hrs.

London.—Institute of Transport, Metropolitan Graduate and Student Society lecture, "Development of New Aircraft and their Testing," by Sqn. Ldr. H. G. Hazelden, at 80 Portland Place, W.1, at 17.45 hrs.

Nov. 1

London.—Royal United Service Institution lecture, "Thoughts on the Nuclear Deterrent," by Marshal of the Royal Air Force Sir Dermot Boyle, at Whitehall, S.W.1, at 15.00 hrs.

Nottingham.—Institution of Production Engineers, North Midlands Region lecture, "Fabrications in Aircraft Gas Turbine Engines," by W. E. Corbitt, at Nottingham Reform Club, Victoria Street, at 19.00 hrs.

Company Notices

NEW COMPANIES

Aviation Services (London), Ltd. (704,204).—Private co. Reg. Sept. 27. Cap. £100 in £1 shrs. To carry on the business of manufacturers of and dealers in aeroplanes. Secr.: Patricia Freeman. Reg. off.: 25 Harley Street, W.1.

Uni-Avia (London), Ltd. (704,454).—Private co. Reg. Sept. 29. Cap. £100 in £1 shrs. To manufacture, buy, sell, maintain, hire and deal in aircraft and equipment, components and parts. Directors: Homi Chothia and Betty J. Chothia, both of 171 Court Lane, Dulwich, S.E.21. Secr.: Betty J. Chothia. Reg. off.: 12 Bury Place, W.C.1.

INCREASES OF CAPITAL

Peter S. Clifford and Co., Ltd. (672,264) (Aviation consultants, etc.), "Tresa," Bletchington Road, Kirtlington, nr. Oxford.—Increased on Mar. 15, 1961, by £9,000 in £1 "A" ordinary shrs., beyond the reg. cap. of £1,000.

Dowty Group, Ltd. (530,526), Arle Court, Cheltenham.—Increased on Mar. 30, 1961, by £500,000 in 10s. shrs., beyond the reg. cap. of £6,000,000.

New Patents

APPLICATIONS ACCEPTED

883,103.—**M. L. Aviation Co., Ltd.**—"Apparatus for towing aerial targets." July 1, 1960. (July 13, 1959.)

883,158.—**Borgs Fabriks A.B.**—"Arresting net for aeroplanes." April 4, 1960.

883,159.—**P. B. Fonden and K. O. T. Walander.**—"Runaway-preventing device for aeroplanes." April 4, 1960. (June 3, 1959.)

Printed specifications of the above will be available on Nov. 22, 1961, and the opposition period will expire on Feb. 22, 1962.

Personal Notices

BIRTHS

Bradley.—On Sept. 29, at R.A.F. Hospital, Nocton Hall, to Christina (*née* Liliant), wife of Flt. Lt. R. Bradley—a son.

Firth.—On Oct. 3, at Warneford Hospital, Leamington, to Shirley, wife of Flt. Lt. P. A. Firth—twin sons.

Glover.—On Oct. 1, at the Youngberg Memorial Hospital, Singapore, to Margaret, wife of Flt. Lt. R. B. Glover—a son.

Hopkins.—On Sept. 27, at P.M.R.A.F. Hospital, Halton, to Jean (*née* Barton), wife of Flt. Lt. H. L. Hopkins—a daughter.

Marriott.—On Oct. 2, at Bristol, to Jill (*née* Agar), wife of Flt. Lt. J. F. Marriott—a son.

Neville.—On Oct. 6, at Exeter, to Shelagh (*née* Mulholland), wife of Wg. Cdr. C. Neville—a daughter.

Pitcairn-Hill.—On Oct. 6, at Eastbourne, to Patricia (*née* Collacott), wife of Flt. Lt. C. Pitcairn-Hill—a son.

DEATHS

McStay.—On Oct. 2, at P.M.R.A.F. Hospital, Halton, Wg. Cdr. W. B. McStay, I.D.S., R.A.F.

Mundy.—On Oct. 3, at Thame, Wg. Cdr. F. W. Mundy, R.A.F. (retd.).

STC AIRBORNE RADIO STR.18 series

This well-known range of H.F. Transmitters and Receivers is widely used in aircraft of many of the world's leading airlines and air forces.

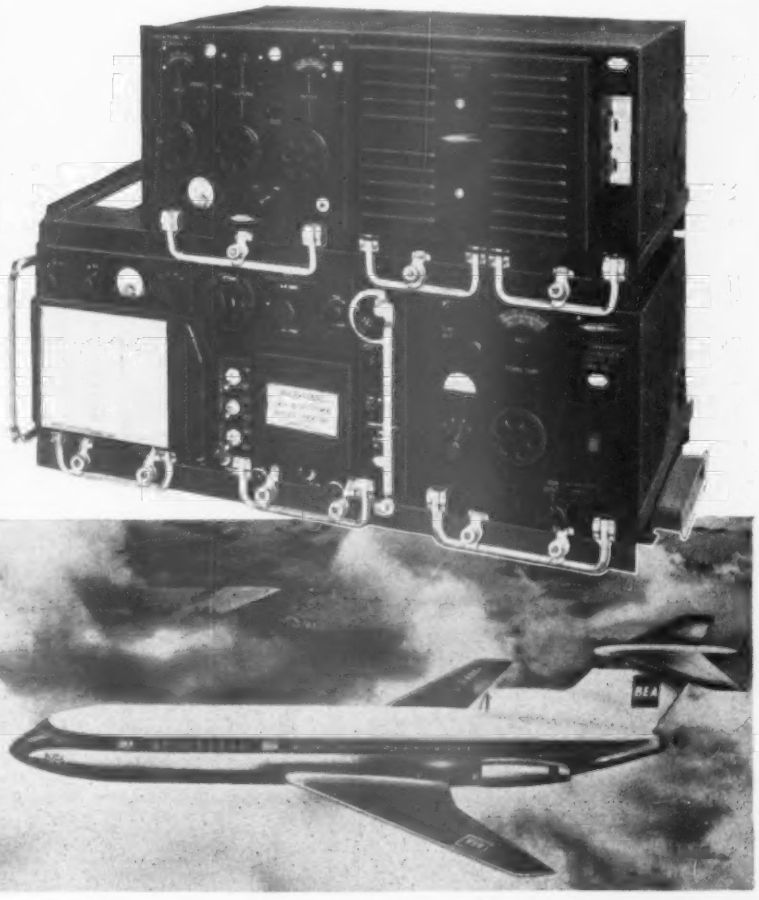
Operating as pilot-controlled radio-telephony equipments, they also provide facilities for C.W. and M.C.W. operation at the main equipment.

The aerial used may be either the conventional wire type or a suppressed notch.

STC engineers have conducted extensive development on notch aerial systems, and the Company is now able to supply these to suit the specific requirements of individual aircraft.

The STR.18 equipments have a frequency range of 2.8 - 18.1 Mc/s with an output power of 100 watts, the STR.18-B/2 providing 24 pre-set channels and the STR.18-C and STR.18-C/1 each operating on any one of 100 channels.

The STR.18-B/2 and STR.18-C require power supplies of 28 volts d.c. and 19 volts d.c. with internal blower cooling. The STR.18-C/1, operating with a 28 volts d.c. supply only, is cooled by the aircraft centralized cooling system.



The STR.18-C/1 and notch aerial have been specified by British European Airways for their "Trident" fleet of aircraft.

These equipments are described in Radio Leaflets 207, 216 and 262.

STC COMMUNICATIONS GROUP

61/8

Standard Telephones and Cables Limited

RADIO DIVISION: OAKLEIGH ROAD · NEW SOUTHGATE · LONDON N.11

CLASSIFIED ADVERTISEMENTS

PRESS DAY: Classified Advertisements must normally be received at Head Office by FIRST POST THURSDAY for the following Thursday's issue. Last-minute additions and deletions are accepted by telephone from trade advertisers up to noon. Advertisements received too late for a particular issue are automatically inserted in the succeeding one unless instructions to the contrary are received.

RATES—1/- per word (minimum 12 words 12/-). Each paragraph charged separately and name and address must be paid for. Semi-displayed setting £3-17-6 per single column inch. Centred lines 22/6. Series discounts of 5% for 13, 10% for 26 and 15% for 52 consecutive insertions, allowed to trade advertisers.

TERMS—Strictly net and prepayable. Monthly accounts for settlement by the end of the month following insertion are allowed to trade advertisers if satisfactory references are provided.

REMITTANCES—Cheques and postal orders should be crossed and made payable to TEMPLE PRESS LIMITED and instructions sent addressed to the Manager, "The Aeroplane and Astronautics," Bowling Green Lane, London, E.C.1.

DEPOSIT SYSTEM—Facilities are available to readers to purchase advertised goods through "The Aeroplane and Astronautics." Commission 1% (minimum 2/-) on amount deposited.

BOX NUMBERS—Private advertisers desiring to have replies sent care of "The Aeroplane and Astronautics," may do so on payment of 1/- to cover booking and postage, plus cost of four extra words. Box Numbers must not be used for the purpose of circularizing and the Proprietors do not undertake the distribution of such matter received. To avoid mistakes in forwarding, Box Numbers should be carefully and legibly copied and replies sent to Box A000, care of "The Aeroplane and Astronautics," Bowling Green Lane, London, E.C.1.

THE PROPRIETORS retain the right to refuse or withdraw advertisements at their discretion and are not responsible for clerical or printers' errors, although every care is taken to avoid mistakes.

HEAD OFFICES: Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus London Telex." Telex: 23839.

BRANCH OFFICES: Bayliss House, Hurst Street, Birmingham, 5. Telephone: Midland 6616. 50 Hertford Street, Coventry. Telephone: Coventry 27414. 1 Brazennose Street, Manchester. Telephone: Deansgate 6114–8. 12 Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

30 YEARS EXPERIENCE & SERVICE

LIGHT AIRCRAFT DIVISION

AUTOCRAT. Cirrus Minor 2. 380 hrs. s.c.o. C. of A. July 1962. **£795.**

AUTOCAR. Gipsy Major 10 Mk. 1. 400 hrs. s.c.o. V.H.F. radio. C. of A. January 1963. **£2,500.**

CESSNA 172. 1960 model. 140 hrs. since new. 3-year C. of A. **£3,650.**

CARIBBEAN. Built 1960. Under 60 hrs. since new. Commercial C. of A. June 1962. 15% off list price.

TRI-PACER. Built 1956. Total time 690 hrs. New C. of A. **£2,650.**

TRI-PACER. Built 1960. Total time 105 hrs. New C. of A. Collins radio. **£4,500.**

EXECUTIVE AIRCRAFT DIVISION

COMANCHE 250. Late 1959. Total time 375 hrs. Class 1 radio. **£8,500.**

DEBONAIR. 1960 demonstrator. Only 100 hrs. since new. Beautiful condition. **£10,500.**

BONANZA. 1960 demonstrator. 150 hrs. total time. Many extras. **£13,250.**

TRAVELAIR. Built 1960. 190 hrs. total time. List price less reduction of £25 per hour flown.

CESSNA 310. Choice of 6 aircraft from 1956 310 at **£16,000** to latest 310F.

AZTEC. Choice of three 1960 models, immediate delivery.

TRANSPORT AIRCRAFT DIVISION

DOVE MK. 2. G-ALCU. An ideal executive aircraft at only **£9,995.**

DOVE MK. 5. Only one of the superb ex-Navy Doves still available, offered "as is" **£10,000** or fully overhauled by de Havillands **£23,500.** Radio extra as required.

HERON Series 2D. 4 late series aircraft, airline configuration, de-icing fitted. Offers for package deal.

DC-3. Two very fine ex-B.E.A. aircraft available at **£17,000** and **£17,750.**

DC-3 Executive. Luxuriously appointed 12-passenger interior. Immediate delivery.

VIKING 1. Low hour engines and good life remaining on all modifications, freight door. **£14,000.**

NEW OR USED AIRCRAFT SUPPLIED CREDIT TERMS ARRANGED PART EXCHANGE WITH OTHER AIRCRAFT OR CARS

TELEPHONE:
Monday–Friday 9 a.m. to 6 p.m.
Saturday — 9 a.m. to 1 p.m.
HYDE PARK 2448/9
Cables:
SHACKHUD LONDON W1

SHACKLETON AVIATION LIMITED | 175 PICCADILLY, LONDON, W-1 HYDE PARK 2448/9

EUROPE'S LEADING AIRCRAFT TRADERS

AIRCRAFT FOR SALE

R. K. DUNDAS AERO. LTD.

1957 Lancashire Prospectors. We have two of these unique aircraft on offer, 6 seats, single Lycoming 295 h.p. engine, exceptional STOL performance, V.H.F. radio and long-range tanks; one aircraft has 80 hours, the other 180 hours, engine s.m.o.h.; both have current commercial C.s of A., MR80 23 ch. V.H.F., and one has dual control, excellent value from £5,475.

PERCIVAL Prentice. This aircraft has been used as an executive aircraft and has been maintained to the highest standards regardless expense, 4 seats, innumerable extras, including steel con-rods to increase engine life to 800 hours, duplicated compasses, new tyres, full dual control, well worth your consideration at £2,250.

R. K. DUNDAS AERO. LTD.,
DUNDAS HOUSE,
59 ST. JAMES'S STREET,
LONDON, W.1.
Phone, Hyde Park 3717. Cables, Dundukair.
609-6

PIPER aircraft on view, c/rs taken in part-exchange. Terms. Maidenhead Autos, Bath Rd., Taplow, Maidenhead 4900. zzz-801

AUSTER V. Lycoming engine 250 hours, 4 seats, starter, silencer, C. of A., very smart, £1,200. James Crampton, Oxnead, Norwich. Phone, Buxton 200. 609-x7671

PETER S. CLIFFORD AND CO., LTD., offer:—

TRI-PACER 150 Super, Custom engine 164, airframe 1,400, C. of A. June, 1962, fitted Narco Simplexer 27-channel, plus VOR. £2,995.

TIGER Moth, fitted with electric intercom., engine 100, airframe 2,700, full hire and reward C. of A. expiring 1.6.62. £475.

FURTHER details on request.

OXFORD AIRPORT, Kidlington, Oxford. Kidlington 3355, Bletchington 392. 609-2

TIGER Moths, choice of three, a/c one year C. of A. to go, engines only done 180, 300, 600 hours, fine condition, from £350. Would exchange or hire. Box A093, care of THE AEROPLANE AND ASTRONAUTICS. 609-x8058

There is a JODEL for you.

Either the **AMBASSADEUR** 3 seater or the **MUSKETEER** 4—5 seater.

U.K. Agents:
ROLLASON AIRCRAFT & ENGINES LTD.
REDHILL AIRPORT • • • SURREY
Telephone: NUTFIELD RIDGE 2212

The 150
Cessna
APPOINTED DEALERS

The North & West Midlands: Westair Limited, Squires Gate Airport, Blackpool, Lancs.
East Anglia & East Midlands: W. H. & J. Rogers (Engineers) Ltd., Gt. Barford, Bedford.
West: Steels (Aviation) Limited, Clifton, Bristol.
Scotland: Airwork Services Limited, Perth Aerodrome, Perth, Scotland.

SOLE DISTRIBUTORS IN GREAT BRITAIN ARE
AIRWORK SERVICES
PANSHANGER AERODROME · HERTFORD
TELEPHONE: ESSENDON 315

AIRCRAFT ACCESSORIES, SPARES AND COMPONENTS

THE REGIONAL AIR TRADING CO., Croydon Airport, for Rapide spares of every description. Phone, Croydon 8521. zzz-798

SURPLUS test equipment for sale. Hydraulic pneumatic vacuum, electrical, low temperature, instrument, propeller, tensile, impact, creep, cr ck detection, etc. Send requirements, L. Solloman, Ltd., 1 Beaufort St., Manchester, 3. Phone, Blackfriars 4761. 609-634

PHILLIPS AND WHITE, LTD.

THE leading stockists in the U.K. for instruments, navigational equipment, electrical components and parts and engine accessories. Spares for de Havilland Gipsy, Major and Queen series and Armstrong Siddeley, Cheetah IX and XV engines.
61 QUEEN'S GARDENS, London, W.2. Phone, Ambassador 8651, 2764. Cables, "Gyrurn, London." zzz-804

NYLON parachutes recently released by A.M., back or seat type, superb condition, £8 carriage paid. **MOBILE** SALES CO., 101-3 Brixton Hill, London, S.W.2. Tulse Hill 0121. 609-4

CLOTHING

R.A.F. Officers' uniforms for sale, new and reconditioned. Fisher's, 86-88 Wellington St., Woolwich. Phone 1055. Kits also purchased. zzz-805

CONSULTANTS

IAN L. S. McNICOL, London School of Air Navigation. Pilot and navigator training with advisory service. 33 Ovington Square, Knightsbridge, S.W.3. Ken 8221. zzz-791

R. W. SUTTON (CONSULTANTS), LTD., 7 Lindovane Place, Cheltenham. Phone 5811. 614-663

HIRE-PURCHASE

HIRE-PURCHASE on your own plane. We will buy your machine and hire-purchase it back to you over three years. Raymond Way Motors, Ltd., Kilburn, N.W.6. Maida Vale 6044. 609-786

PACKING AND SHIPPING

R. AND J. PARK, LTD., Dominton Works, Thames Rd., Chiswick, London, W.4. Phone, Chiswick 7761. Official packers and shippers to the aircraft industry. zzz-0782

BST ARB Approved

Aeronautical Co. Ltd.

C47 · DC-3 Specialists

Stockists of British and American A.G.S. and A.N. spares for all types of British and American aircraft, from Austers to Viscounts, from Pipers to DC-4s.

24 hour A.O.G. service operated, cable or telephone your requirements.

All enquiries handled by experts with many years' aviation experience. Alternatives can often be supplied from stock if original parts are not available.

Comprehensive stock list sent by return. Purchasing agents for foreign governments and overseas airlines.

84 ALEXANDRA ROAD,
Farnborough · Hants

Telephone: Farnborough 2881/2/3.
Emergency: Guildford 66958
Cables: Bestair, Farnborough, Hants.

TRADAIR LIMITED
at
SOUTHEND AIRPORT
urgently require
SKILLED
AIRCRAFT ELECTRICIANS

Experience on Viscount and/or Viking Aircraft an advantage. Top salaries will be paid, and every consideration will be shown.

Please apply in detail to:
CHIEF ELECTRICAL ENGINEER
Tradair Limited, Southend Airport
Southend-on-Sea, Essex

I FLY PIPER

Sole Distributors in the U.K.
VIGORS AVIATION LTD. OXFORD AIRPORT. KIDLINGTON 3444

A. V. ROE & CO. LIMITED

have immediate vacancies for

ELECTRICAL INSTRUCTORS

for posts in the Company's Technical Training School at Woodford, Cheshire.

The selected applicants will be responsible for the training of R.A.F. and civil airline personnel and experience of modern aircraft electrical systems is essential. The probable age range is from about 25 to 40.

The school is situated at an airfield in a pleasantly rural part of Cheshire with good access to shops, housing and transport.

Please write, giving full details and quoting reference R.40.B. to:

The Personnel Officer
A. V. ROE & CO. LIMITED
Greengate, Middleton, Manchester

MEMBER OF HAWKER SIDDELEY AVIATION

RADIO AND RADAR

STR12D, STR9Z, STR9X and most other British and American V.H.F. R/T equipment always in stock. A.R.B.-approved design installations into any type of aircraft. A. J. Whittemore (Aeradio), Ltd., Biggin Hill Aerodrome, Kent. zzz-781

SITUATIONS VACANT

CHIEF Flying Instructor and Assistant Instructor required permanent positions. Full details of experience, licences and ratings etc., to Bristol and Wessex Aeroplane Club, Ltd., Bristol (Luisgate) Airport, Bristol. 609-671

AIRWORK INTERNATIONAL, LTD. (a British United Airways Co.) invite applications from aircraft engineers licensed for Dove/Twin Pioneer for service in the Middle East. Salary commencing at £1,175 p.a., plus allowances of £1,296 p.a.—for bachelors or married men not accompanied by their families, or £1,550 p.a. for married men accompanied by their families. Contract period two years with an option to renew, 48 days annual leave with free passages by air.

THERE will also be a requirement for a temporary engineer for Beaver operations in West Africa for a period of three or four months as from March, 1962; salary and allowances in the range £2,150-£2,250 p.a. dependent on qualifications, free accommodation. Applications in writing should be addressed to Airwork International, Ltd., Redhill Aerodrome, Surrey. 609-670

GROUND Engineer required, A and C licences, permanent position. Apply: Bristol and Wessex Aeroplane Club, Ltd., Bristol (Luisgate) Airport, Bristol. 609-672

PHYSICISTS
IN
GOVERNMENT SERVICE
A SCIENTIFIC CAREER
SECOND TO NONE

Following are examples of vacancies at SCIENTIFIC OFFICER (£708-£1,222) or SENIOR SCIENTIFIC OFFICER (£1,442-£1,654) level now available:—

SIGNALS RESEARCH AND DEVELOPMENT ESTABLISHMENT, Christchurch, Hants.—SPEECH RESEARCH, including speech perception and the analysis and synthesis of speech involved in a SPEECH BANDWIDTH COMPRESSION system. Some experience of electronic techniques is desirable (Scientific Officer or Senior Scientific Officer).

SAFETY IN MINES RESEARCH ESTABLISHMENT, Sheffield.—Basic Physical investigations into operations of catalytic and chemically active elements which may be used for GAS DETECTION AND MEASUREMENT (Scientific Officer).

NAVAL CONSTRUCTION RESEARCH ESTABLISHMENT, Dunfermline.—Post for a Mathematician or Mathematical Physicist to work on DYNAMIC BEHAVIOURS OF STRUCTURES, elastic stability stress analysis and plastic collapse, in close liaison with experimental division. The Establishment possesses a strong electronics computing group. (Senior Scientific Officer).

ROYAL OBSERVATORY, Edinburgh.—Research in fields of STELLAR PHOTOMETRY (galactic structure) and SPECTROSCOPY (stellar constitution). Observational facilities include 16/24-in. Schmidt telescope and 36-in. reflector with grating spectrograph. Programmable twin reflector with digitised photometer under construction. (Senior Scientific Officer).

There are many other vacancies in PHYSICS, ENGINEERING and most other scientific disciplines. All posts carry a pension. Good promotion prospects.

Inquiries to—
CIVIL SERVICE COMMISSION,
(Scientific Branch),
17 NORTH AUDLEY STREET,
LONDON, W.1.
Stating age, qualifications, etc. 609-5

ADEN AIRWAYS (B.O.A.C. Associate). Due to continued expansion with the impending introduction of the Avro 748, Aden Airways are seeking additional Licensed Aircraft Engineers. Essential qualifications are sound, practical experience, "A" Licence on DC3, Argonaut and/or "C" Licence on P. & W. 1830 and R.-R. Merlins. Turbine experience or licences a considered advantage. Salaries in the range £1,548 to £1,938 p.a., dependent upon qualifications and experience, with income tax paid, free furnished accommodation for both married and single engineers. Sixty days' U.K. leave per annum, free passages for successful applicant and his family, together with generous contributory pension, provident and medical schemes. Engineers interested in an interview are asked to forward full details of qualifications and experience in strict confidence to Personnel Manager, B.O.A.C. Associated Companies, Ltd., Airways Terminal, Buckingham Palace, Rd., London, S.W.1. 6/9/66

QUALITY ENGINEER
REQUIRED FOR WORK ON AIRCRAFT AND AERO ENGINE COMPONENTS AND ASSEMBLIES.

Minimum qualifications would be H.N.C. (Mech.E.), and the salary commensurate with experience which must include a sound engineering background, with preferably a knowledge of A.I.D. procedure.

Applications should be addressed to the
PERSONNEL MANAGER,
J. R. BRAMAH AND CO. LTD.,
HALFWAY, NR. SHEFFIELD. 609-1

PILOT wanted immediately for crop-spraying contract in Sudan (Austers). Phone, Buxton 200 (Norwich). 609-7931

FLY . . .
in the *MODERN MANNER*

in THE AERO 145
LIGHT TWIN 4-SEATER

- **Lowest priced light Twin in the world**
- **Retractable Undercarriage**
- **V.P. Propellers**
- **Fuel injection for economy and safety**
- **Cruises at 160 m.p.h. with a consumption of only 10 g.p.h. (16 m.p.g.)**
- **Comfortable 4 seat cabin with exceptional all round view**
- **British C of A Validation in full Public Transport Category (Group C)**
- **Comprehensive Standard Equipment**
- **Full spares backing**

Enquiries also welcomed for the Morava L200A and the elegant single engine Meta-Sokol.

SOLE U.K. AGENTS
PETER S. CLIFFORD & CO. LTD.
Oxford Airport, Kidlington
Phone Kidlington 3355; Evenings and W/Ends Bletchington 392
in conjunction with
G/C Edward Mole, U.K. Distributor
World wide Distributors OMNIPOL, PRAGUE

Keegan Aviation LTD

WHAT WE ADVERTISE
WE OWN

AIR TAXI OPERATORS

The
"RILEY 65"
now has a full public transport C. of A.

On 400 hours per year it costs just
£21 per hour to run.

It covers 220 miles in the hour.

For four passengers this equals **5½d.** a seat mile.

Average trip costs:

LONDON — NEWCASTLE	£25
LONDON — PARIS	£23
LONDON — LIVERPOOL	£20

Why not provide the fastest transport at the lowest cost? AND Make money!

Send now for full details of the amazing **"RILEY 65."**

Keegan Aviation Ltd.
PANSHANGER AERODROME
HERTFORD HERTS
Telephone: Essendon 491/2/3
Cables: Planesales Hertford Telex: 1943

Situations Vacant—contd.

KUWAIT AIRWAYS (B.O.A.C. Associate) require immediately A and C licensed Viscount engineers to be based in Kuwait; excellent conditions of service including free, furnished accommodation, 56 days annual leave with free passage for engineer and family to and from U.K., medical and pension-provident schemes, free life insurance cover, etc.; salary in the range £1,791 to £2,171 p.a., income tax free. Applications with brief details of licences should be addressed to Personnel Manager, B.O.A.C. Associated Companies, Ltd., Airways Terminal, Buckingham Palace Rd., S.W.1. 610-674

CITY OF PORTSMOUTH

AIRPORT MANAGER.

APPLICATIONS ARE INVITED FOR THE POSITION OF

AIRPORT MANAGER.

The airfield comprises four grass runways each approximately 3,000 ft. long. Schedule passenger services are operated between Portsmouth and the Channel Islands and Paris and it is anticipated that freight services will shortly be operated. Customs facilities have recently been provided. The Airport Committee have leased sites for industrial purposes on the perimeter.

Candidates should have experience as pilot or air traffic controller and be familiar with air traffic regulations and have a knowledge of aerodrome equipment and maintenance.

Salary—£1,515-£1,670 (N.J.C. Grade "B"). Applications, accompanied by copies of three recent testimonials, should be made to the undersigned not later than November 15, 1961. The successful candidate will be required to pass a medical examination for superannuation purposes.

J. R. HASLEGRAVE,
Town Clerk.

Guildhall,
Portsmouth.
October 19, 1961. 609-3

SENIOR and intermediate aircraft stress engineers, with about five years' experience, must have the "designer approach" and be prepared to work with minimum supervision on new civil aircraft projects, required in the expansion programme of a small, virile, but well-established design team. If you are looking for an interesting and progressive post, not too far from London, write giving details of your career to date, and an indication of salary required. All applications will be acknowledged and treated in strictest confidence. Apply Box A091, care of THE AEROPLANE AND ASTRONAUTICS. 611-675

BRITISH
WIRE THREAD INSERTS

Precision made in Carbon Steel for Aluminium and Magnesium. Also in Stainless Steel and Bronze.

B.S.F. · Metric · B.S.P. · B.A.
Whitworth · Unified

CROSS MANUFACTURING CO. (1938) LTD
COMBE DOWN · BATH · SOMERSET
Phone: COMBE DOWN 2351/4 Grams: CIRCLE BATH

Southend Municipal Flying School
offers comprehensive training (day and night) for commercial and private pilots in the environment of an international airport. No entrance fees. Airport Club available to members.
Austers £4.5s. solo; £4.15s. dual; contract rate £4. Chipmunk £5.10s. dual or solo.
Municipal Airport, Southend-on-Sea, Essex
Phone: Southend-on-Sea 40201

A SMALL but expanding design organization offers progressive appointments to experienced aircraft loftsmen, for both detail and lines work on new civil aircraft projects. All applications, which should give details of age, experience and salary required will be acknowledged and treated in strictest confidence. Apply Box A092, care of THE AEROPLANE AND ASTRONAUTICS. 611-676

GHANA AIRWAYS require immediately "A" and "C" licensed aircraft engineers on the Viscount 800 Series with Rolls-Royce Dart 500-525 Series. In addition immediate appointments exist for three radio maintenance engineers with radar endorsements and one "X" licensed instrument engineer, all working in conjunction with the new Viscount fleet. Salary in the range £G7,650 to £G12,100 p.a. income tax free plus children's allowance together with excellent car loan, pension-provident fund, medical scheme, free furnished accommodation and 56 days' annual leave with free passages for engineer and family to U.K. Applications with brief details of licences should be addressed to Personnel Manager, B.O.A.C. A.C. Ltd., Airways Terminal, Buckingham Palace, Rd., S.W.1. 610-673

TUITION

DENHAM LINK TRAINING CENTRE, DH and PANT 18 Trainers. Instrument ratings, renewals and latest procedures for flights to any aerodrome in the world, 21s. an hour. Denham 3171. zzz-797

LEARN to fly, £37; Instructors' Licence and Instrument flying for £4 12s. 6d. Night flying £5 12s. 6d. per hour. Residence 6 gns. weekly. Specialized course for Commercial Pilot's Licence. Wiltshire School of Flying, Ltd., Thruxton Aerodrome (Andover Junction 1 hr. 15 min. from Waterloo). Hants. zzz-799

SCHOLARSHIPS AND CAREERS

Await selected students who are fortunate enough to be trained with the organization that has 23 years' experience and has trained more than 14,000 pilots. To be considered for the course starting on March 6, 1962 (the earliest date on which there are vacancies).

Please apply without delay to

AIR SCHOOLS, LTD.,
THE AERODROME,
ELSTREE, HERTS.

610-675

LONDON SCHOOL OF AIR NAVIGATION offers full-time personal coaching with home-study correspondence courses or combination of both for all aspects of professional pilot and navigator qualifications, also P.P.L. Officially appointed Service Courses Scheme. 33 Ovington Square, Knightsbridge, London, S.W.3. Ken 8221. zzz-792

camera in the sky

BY CHARLES SIMS

PREFACE BY AIR CHIEF MARSHAL SIR JAMES ROBB

For more than 30 years Charles Sims chief photographer of *The Aeroplane and Astronautics*, one of Britain's best-known aerial photographers, has watched the growth of British aviation from a ringside seat more often in the air than on the ground. In this book, illustrated by over 200 of his finest photographs, he recalls with pen and camera the highlights and the humours, the airmen and the aircraft, of aviation's most eventful years.

224 pages 25s. net By post 27s.
From Booksellers, or by post from

TEMPLE PRESS LTD.
BOWLING GREEN LANE · LONDON · EC1

MINISTRY OF AVIATION

AIR TRAFFIC CONTROL OFFICERS

Posts for men or women at least 23 and under 35 on 1/7/61. Candidates must have had recent aircrew experience, preferably as pilot or navigator in civil air transport or H.M. Forces; but exceptionally, extensive experience in A.T.C.O. duties may be accepted. They should normally also have G.C.E. with five passes, or an equivalent academic qualification. Starting salary (London) from £872 to £1,251. Maximum £1,599. Appointment initially unestablished, but prospects of establishment and promotion.

Apply:

MINISTRY OF AVIATION
EST 5(a) 1/R 758 THE ADELPHI
JOHN ADAM STREET, LONDON, W.C.2

FOR SALE

4-SEAT MORANE SAULNIER JET, MODEL PARIS I, MANUFACTURED IN 1959. IN PERFECT STATE. AVAILABLE EX ITALIAN AIRPORT WITHIN END OF DECEMBER.

ALL DETAILS SUPPLIED WRITING TO:

CASELLA POSTALE 3757
MILAN, ITALY

AIR SERVICES DIVISION
PRESSED STEEL COMPANY LIMITED

has the following vacancies:—

(a) 'A' Licensed Radio Engineer

(b) 'A' and 'C' Licensed Engineer capable of taking charge of Executive Fleet of Aircraft. Applicants must have had extensive experience on the following Aircraft and Engines—D.H. Dove, D.H. Heron, Cessna 310, Piper, Apache and Aztec, D.H. Gipsy Queen 30 and 70, Continental IO-470, Lycoming O-320/B3B and O-540.

Unlicensed Engineers, with the necessary experience, would be considered for position (b).

Applications in writing, giving full details, should be addressed to—

Works Superintendent
Air Services Division
Pressed Steel Company Limited
Oxford Airport
Kidlington, Oxon.

SHORT BROTHERS & HARLAND LIMITED

RADIO LICENSED ENGINEER

required with current category B (R) licence

THE APPOINTMENT IS A SENIOR ONE AND CARRIES EXECUTIVE STATUS.

The Company operates a Superannuation Fund with which is associated free Life Insurance.

Assistance with housing and with removal expenses is available to the successful candidate, if married and resident in Great Britain.

Interviews will be held in London and Belfast.

Applications which will be treated in strict confidence, should give full details of qualifications, experience, age, etc., and should be addressed to :-

Personnel Manager
SHORT BROTHERS & HARLAND LIMITED
P.O. Box 241, BELFAST, 3

THE BRITISH AIRLINE PILOTS ASSOCIATION

81, New Road, Harlington, Middx. *Tel.* HAYes 3442/3

Membership open to all Commercial and Service Pilots. For full details as to Objects and particulars of Membership, please write to General Secretary.

CROSS PERFECT PRECISION AIRCRAFT SPRING WASHERS
TO B.S. SPECIFICATION 2 SP.47
CROSS MFG. CO. (1938) LTD
COMBE DOWN. BATH. Tel.: Combe Down 2366

TECHNICAL WRITER

REQUIRED FOR THE PRODUCTION OF HIGH QUALITY BROCHURES AND TECHNICAL REPORTS

The post requires a man of sound judgement and considerable experience in the engineering industry preferably with some theoretical knowledge in the hydraulics and gas turbine fields.

The appointment will be based initially at Ilford but later a move to the South Coast is likely.

In view of the considerable responsibility involved it is envisaged that a high salary will be paid.

★ *Please reply, giving full details of experience, to*
The Personnel Manager
The Plessey Company Limited
Vicarage Lane, Ilford, Essex

Plessey

CLASSIFIED ADVERTISEMENT ORDER FORM

TO : The Aeroplane and Astronautics, Bowling Green Lane, London, E.C.1

PLEASE INSERT THE FOLLOWING ADVERTISEMENT IN THE NEXT.....ISSUE/S

UNDER THE HEADING OF.....

Rate 1/- per word (minimum 12 words 12/-) Box Numbers : allow 4 extra words plus 1/- registration fee

● Press Time : 10 a.m. Thursday

						Min.
						12/-
13/-	14/-	15/-	16/-	17/-	18/-	
19/-	20/-	21/-	22/-	23/-	24/-	
25/-	26/-	27/-	28/-	29/-	30/-	
31/-	32/-	33/-	34/-	35/-	36/-	

★ *Please use BLOCK letters throughout*

Name and address, if to be used in the advertisement, must be included above and paid for

NAME : .....

ADDRESS : .....

.....

REMITTANCE ENCLOSED FOR...../.....

Remittance should be crossed and made payable to TEMPLE PRESS LTD.

SIGNATURE : .....

Tuition—contd.

SURREY AND KENT FLYING CLUB, Biggin Hill. (B/W 2255). Ab-i-o-A approved course. Tiger and Hornet Moths. Chipmunk and Prentice. Contract clubs. Route 705, one hour from Victoria. 689-0761

INSTRUMENT rating, contact the acknowledged experts for the Link and flying trainers in London and at Oxford Airport. Link Training Services, Ltd., Corn Court, Carter Lane, Ludgate Hill, E.C.4. Phone: City 6745. 611-651

EXETER SCHOOL OF FLYING offers the least expensive and most comprehensive flying training available. We specialize in Commercial Pilot's training and Instructor's training and our private pilot's course is approved. Contract rates from £3 18s. 6d. Full Air Traffic Control, V.H.F./D.F. and 24-hr. Met. Service, radio-equipped aircraft, grass or runways, local accommodation from £5 10s.; airport £5 15s. 6d. Exeter Airport, Ltd., Exeter. Phone 6433. ZZZ-800

AVIGATION, LTD., provides full-time or postal tuition or a combination of these methods for M.o.A. Pilot-Navigator licences. Classroom instruction can be provided for A.R.B. General and Performance Schedule examinations. D4 Links. Phone: Rodney 8671. For details apply Aviation, Ltd., 30 Central Chambers, Ealing Broadway, London, W.5. Ealing 8949. ZZZ-803

BOOKS AND PUBLICATIONS

"THE AEROPLANE" PICTORIAL REVIEW (No. 5). Staff of THE AEROPLANE AND ASTRONAUTICS. This fifth annual collection of outstanding aviation pictures contains over 200 photographs grouped in 12 sections and descriptively captioned. Illustrated, 128 pages, 15s. 6d. net from booksellers, or 13s. 7d. by post from the publishers, Temple Press Limited, Bowling Green Lane, London, E.C.1. Other volumes available in this series: THE AEROPLANE Pictorial Review, No. 3, 10s. 6d. (post free, 11s. 7d.). The AEROPLANE Pictorial Review, No. 4, 12s. 6d. net (post free, 13s. 7d.). All other volumes in this series are now out of print. ZZZ

THE EXPLOITATION OF SPACE (First Cheap Edition), by A. C. Clarke. Provides answers to the many questions the intelligent layman asks about the science of astronautics. Over 370,000 copies sold in all editions. Illustrated, 212 pages, 8s. 6d. net from booksellers, or 9s. 5d. by post from the publishers, Temple Press Limited, Bowling Green Lane, London, E.C.1. ZZZ

MODERN AIRCRAFT DESIGN, by J. L. Naylor. Provides technicians in allied industries with an account of the wide background of knowledge behind the design of modern aircraft. Illustrated, 128 pages, 9s. 6d. net from booksellers, or 10s. 2d. by post from the publishers, Temple Press Limited, Bowling Green Lane, London, E.C.1. ZZZ

PRINCIPLES OF HELICOPTER ENGINEERING, by Jacob Shapiro. This comprehensive review of the engineering principles governing the design and construction of helicopters provides a complete survey of recent knowledge in the field. Illustrated, 448 pages, 55s. net from booksellers, or 56s. 9d. by post from the publishers, Temple Press Limited, Bowling Green Lane, London, E.C.1. ZZZ

"AEROPLANES AND AERO-ENGINES" (4th Edition). A new edition comprising 24 two- and three-page cutaway drawings which includes a variety of English civil and military aircraft and 10 piston-engine, jet and gas-turbine power plants. Illustrated, 56 pages, price 5s. net from booksellers, or 5s. 7d. by post from the publisheds, Temple Press Limited, Bowling Green Lane, London, E.C.1. ZZZ

THE "POWER AND SPEED" SERIES FOR BOYS. "Aircraft and Air Power," by F. G. Swanborough of THE AEROPLANE AND ASTRONAUTICS, has been written for intelligent boys between the ages of 10 and 16. The author surveys modern military flying and includes chapters of combat aircraft, scientific aids and missiles. Other titles in the Series are: "Motorcars," "Locomotives" and "Ships and Shipbuilding." Illustrated, 112 pages, 10s. 6d. net from booksellers, or 11s. 5d. by post from the publishers, Temple Press Limited, Bowling Green Lane, London, E.C.1. ZZZ

INDEX TO ADVERTISERS

Name	Page
A	
Aircraft Accessories, Ltd.	12
Airwork Services, Ltd.	14
B	
Boulton Paul Aircraft, Ltd.	Inside Front Cover
British Aircraft Corporation, Ltd.	8, 9
British Airline Pilots Association	17
B.S.T. Aeronautical, Ltd.	15
C	
Casella	16
Clifford, Peter, & Co., Ltd.	15
Cross Manufacturing Co. (1938), Ltd.	16, 17
D	
Decca Radar, Ltd	Inside Back Cover
F	
Fletcher, C. W. & Sons, Ltd.	2
G	
Goodyear Tyre & Rubber Co. (G.B.), Ltd.	6
H	
Hampson Industries, Ltd.	3
Hawker Siddeley Aviation, Ltd.	Front Cover, 4, 5, 15
High Duty Alloys, Ltd	10
K	
Keegan Aviation, Ltd.	15
M	
Mallinson, William & Sons, Ltd.	2
Microcell, Ltd.	11
Miller Aviation, Ltd.	2
Ministry of Aviation	16
N	
Newton Bros. (Derby), Ltd.	2
P	
Plessey Co., Ltd., The	17
Pressed Steel Co., Ltd.	17
R	
Rollason Aircraft & Engines, Ltd	14
Rolls-Royce, Ltd.	7
Rotax, Ltd.	Back Cover
S	
Sangamo Weston, Ltd.	12
Shackleton Aviation, Ltd.	14
Short Brothers & Harland, Ltd.	17
Southend Municipal Flying School	16
Standard Telephones & Cables, Ltd.	13
T	
Tradair, Ltd.	15
U	
United Aircraft International	1
V	
Vigors Aviation, Ltd.	15

EDITORIAL AND BUSINESS NOTICES

"THE AEROPLANE and ASTRONAUTICS" is published every Thursday in London, England, by TEMPLE PRESS LIMITED and is registered at the G.P.O. as a newspaper. Second class postage paid at New York, N.Y.

HEAD OFFICES: Bowling Green Lane, London, E.C.1, England. Telephone: Terminus 3636. Telegrams: "Pressimus, London, Telex." Telex: 23839.

BRANCH OFFICES: Bayliss House, Hurst Street, Birmingham, 5. Telephone: Midland 6616. 50 Hertford Street, Coventry. Telephone: Coventry 27414. 1 Brazennose Street, Manchester. Telephone: Deansgate 6114-8. 12 Renfield Street, Glasgow. Telephone: Glasgow Central 1413.

EDITORIAL: All editorial communications and matter must be addressed to the editor and not to individuals. Drawings and MSS, or other material not considered suitable will be returned if stamps are enclosed, but the editor does not hold himself responsible for the safe keeping or safe return of anything submitted for his consideration. Payment for contributions will be made following publication.

ADVERTISEMENTS.—Whilst every precaution is taken to ensure accurate printing, the publishers will not be responsible for printers' errors or for errors arising out of telephonic instructions relating to advertisement copy nor will they be responsible for advertisement blocks destroyed by fire or that are left in their possession for more than one year. Advertisers must in all cases bear the cost of drawings, photographs and/or blocks used in their advertisements. Copy must be supplied without application from the publishers, and current copy and blocks will be repeated if new copy is not received at the time of closing for press. Orders for advertisements are subject to acceptance in writing from the Head Offices. Advertisement copy is subject to the approval of the publishers. All advertisements and contracts are accepted and made upon the express condition that the publishers have the absolute right to refuse to insert any advertisement without stating a reason, including the right of rejection of advertisements, whole or part, containing cut prices of goods coming under an approved price-maintenance scheme, and such refusal shall not be a good ground for advertisers to stop a current contract or refuse to pay for the same or for taking action for breach of contract. The advertisers will indemnify the publishers against any damage sustained by them as a result of the inclusion of their advertisements. The publishers, whilst endeavouring to ensure that advertisements shall appear with all possible regularity, will not be held liable for any loss occasioned by failure of any advertisement to appear from any cause whatever. The acceptance of an order does not confer the right to renew on similar terms. The publishers reserve the right to increase the advertisement rates at any time, or to vary the terms of contract as regards space or frequency of insertion. All orders are accepted on the understanding that any such increase in rate or other amendment may come into immediate operation on all outstanding insertions. In such event, the advertiser has the option of cancelling the balance of contract. Contracts relate to the advertisers' own goods or services, and the space may not be sub-let or disposed of in any way. Conditions which are contained in order forms other than those of the Proprietors and which do not conform to or are in addition to the Proprietors' conditions will not be recognized as binding. Special conditions must be subject to mutual agreement.

SUBSCRIPTIONS AND SUPPLIES.—"The Aeroplane and Astronautics" is obtainable from newsagents and bookstalls or by post from the publishers at an annual subscription rate of £4 15 0 for the United Kingdom, £5 Overseas and $15.00 for Canada and U.S.A., postage included. Shorter periods pro rata. "The Aeroplane and Astronautics" is obtainable from newsagents and bookstalls abroad through the following Agents:—EUROPE—Messageries Dawson (S.A.), Paris; Messageries Hachette et Cie., Paris; W. H. Smith & Son, Paris and Brussels. CANADA—Wm. Dawson Subscription Service Ltd., Toronto; Gordon & Gotch, Ltd., Toronto. U.S.A.—Eastern News Co., 255 Seventh Avenue, New York 1, N.Y. AFRICA—Central News Agency, Ltd., Cape Town; W. Dawson & Son (S.A.), Cape Town. ASIA—W. Thacker & Co., Ltd., P.O. 190 Bombay. AUSTRALIA and NEW ZEALAND—Gordon & Gotch (A'sia), Ltd.

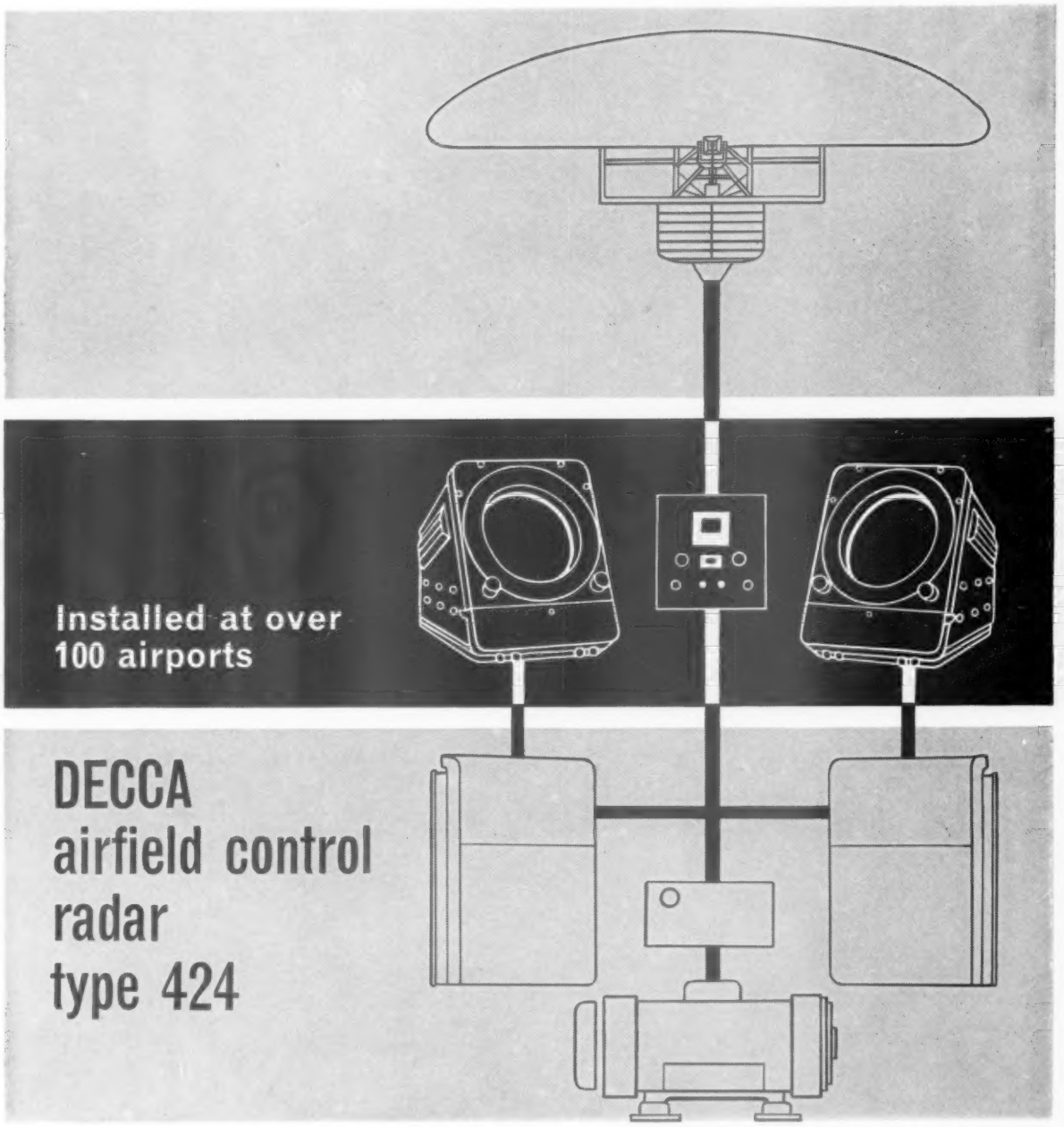
DEPOSIT SYSTEM.—Commission 1 per cent. (minimum 2/-) on amount deposited: full details on application.

REMITTANCES.—Postal Orders, Cheques, etc., should be made payable to TEMPLE PRESS LIMITED.

COMMUNICATIONS.—All orders, letters and inquiries regarding advertisements, subscriptions, the Deposit System and other business matters should be addressed to the Manager, "The Aeroplane and Astronautics" Bowling Green Lane, London, E.C.1.

Printed in England and Published Weekly by the Proprietors, TEMPLE PRESS LIMITED, BOWLING GREEN LANE, LONDON, E.C.1.

Registered at the G.P.O. as a Newspaper. Second class postage paid at New York, N.Y. Registered for transmission to Canada and Newfoundland by magazine post. Annual Subscription Rate United Kingdom 85/-; other countries 100/- (Canada and U.S.A. $15) postage included. Shorter periods pro rata. AGENTS ABROAD—EUROPE—Messageries Dawson (S.A.), Paris; Messageries, Hachette et Cie., Paris; W. H. Smith & Son, Paris and Brussels. CANADA—Wm. Dawson Subscription Service, Ltd., Toronto; Gordon & Gotch, Ltd., Toronto. U.S.A.—Eastern News Co., 255 Seventh Avenue, New York, 1, N.Y. AFRICA—Central News Agency, Ltd., Cape Town; Wm. Dawson & Sons (S.A.), Cape Town. ASIA—W. Thacker & Co., Ltd., P.O. 190, Bombay. AUSTRALIA and NEW ZEALAND—Gordon & Gotch (A'sia), Ltd.



DECCA airfield control radar type 424

The Decca Type 424 Radar—the simplest and most straightforward of all radar landing aids—is highly efficient, accurate, easy to operate and maintain, and is exceptionally reliable. It has the following outstanding features:—

- Twin channel for full and immediate stand-by.
- Unimpaired performance in bad weather.
- Instantaneous multi-runway coverage.
- High landing rate.
- Proved remote control of all functions.
- Low capital and operating cost.
- Straightforward to operate and maintain.

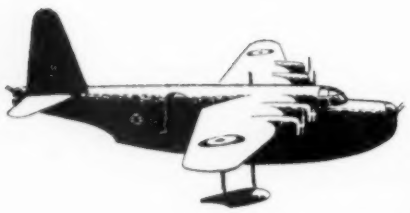
The widespread use of 424 Radar at airports of all sizes is a measure of the confidence placed in it by civil and military authorities throughout the world.

DECCA RADAR

DECCA RADAR LIMITED LONDON ENGLAND

DR 169

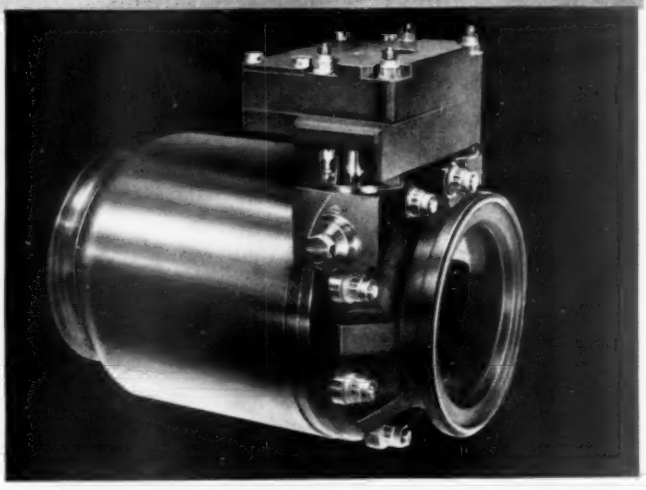
ROTAX BUILDS WITH EXPERIENCE



1935-1961

CONTROL VALVES—As early as 1935 Rotax provided control valve pressure regulation. Today, with over twenty-five years of experience, Rotax design, develop and manufacture all types of control valves for Britain's finest engines and aircraft. The in-line construction of this equipment, the exceptional light weight and the compact design make these valves the most modern available. Backed by the finest facilities, it is success like this with proven performance and lasting reliability, that is built with experience.

If you have a particular aircraft electrical problem, write to:—



ROTAX

WILLESDEN JUNCTION, LONDON, N.W.10. Tel.: ELGar 7777
LUCAS-ROTAX (AUSTRALIA) PTY. LTD., MELBOURNE AND SYDNEY, AUSTRALIA.
LUCAS-ROTAX LTD., TORONTO, MONTREAL AND VANCOUVER, CANADA.

ADVANCED GENERATING AND STARTING SYSTEMS AND ELECTRICAL EQUIPMENT FOR AIRCRAFT